US007716877B2

(12) **United States Patent**
Gilstrap et al.

(10) **Patent No.: US 7,716,877 B2**
(45) **Date of Patent: May 18, 2010**

(54) **GIRDER TIEDOWN**

(75) Inventors: **Jeremy Gilstrap**, McKinney, TX (US); **Jin-Jie Lin**, Livermore, CA (US); **Daniel M. Gray**, McKinney, TX (US)

(73) Assignee: **Simpson Strong-Tie Co., Inc.**, Pleasanton, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1093 days.

(21) Appl. No.: **11/217,572**

(22) Filed: **Aug. 31, 2005**

(65) **Prior Publication Data**

US 2006/0059794 A1 Mar. 23, 2006

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/912,260, filed on Aug. 4, 2004.

(51) **Int. Cl.**
E04B 7/04 (2006.01)

(52) **U.S. Cl.** **52/92.2**; 52/90.1; 52/92.1; 52/712; 403/DIG. 15; 403/232.1

(58) **Field of Classification Search** 52/90.1, 52/92.1, 92.2, 92.3, 93.1, 93.3, 640, 641, 52/713, 714, 712; 248/291.1, 324; 403/DIG. 15, 403/232.1
See application file for complete search history.

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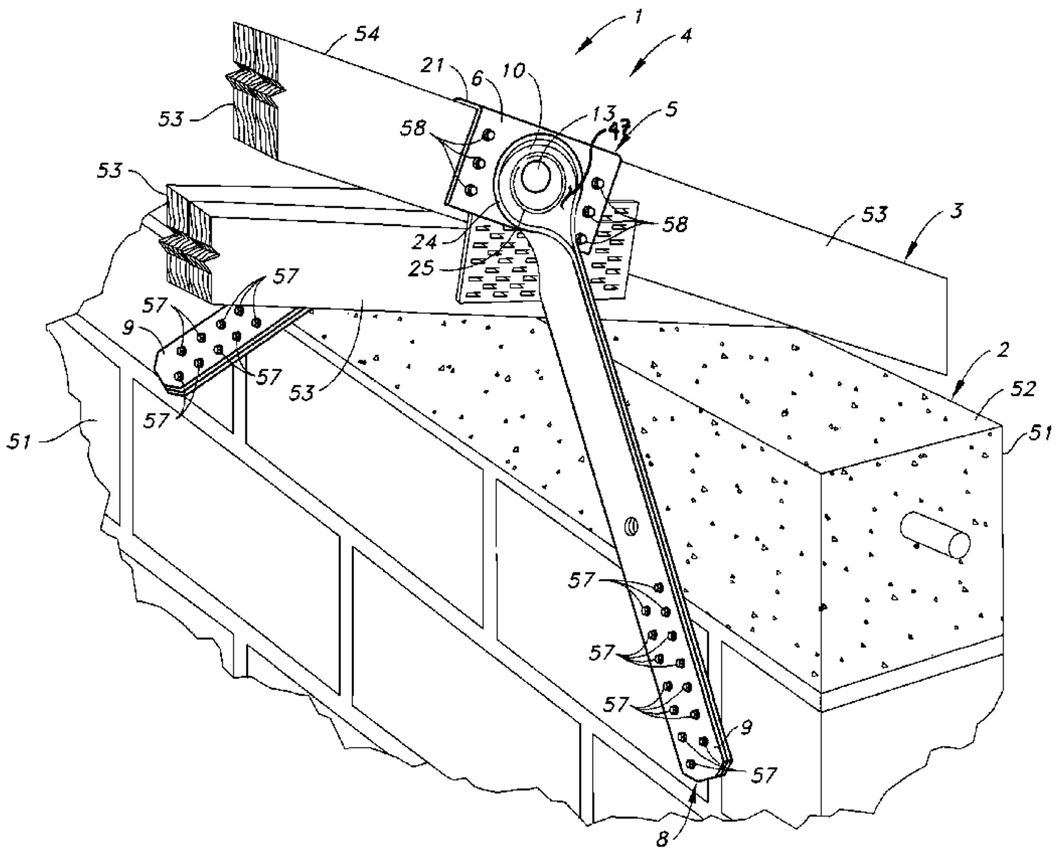
Primary Examiner—Robert J Canfield
Assistant Examiner—Matthew J Gitlin
(74) *Attorney, Agent, or Firm*—James R. Cypher; Charles R. Cypher

(57) **ABSTRACT**

An adjustable connector is provided for connecting an elongate substantially vertical supporting structural member and an elongate generally horizontal supported structural member. The connector is provided with a side attachment member that attaches to an elongate substantially vertical supporting structural member and a cap that attaches to the elongate generally horizontal supported structural member, with a pin connection that enables rotation between the cap and the side attachment member.

An unadjustable connector is also provided for connecting an elongate substantially vertical supporting structural member and an elongate generally horizontal supported structural member. The connector is provided with a side attachment member that can attach directly to an elongate substantially vertical supporting structural member and the elongate generally horizontal supported structural member.

45 Claims, 31 Drawing Sheets



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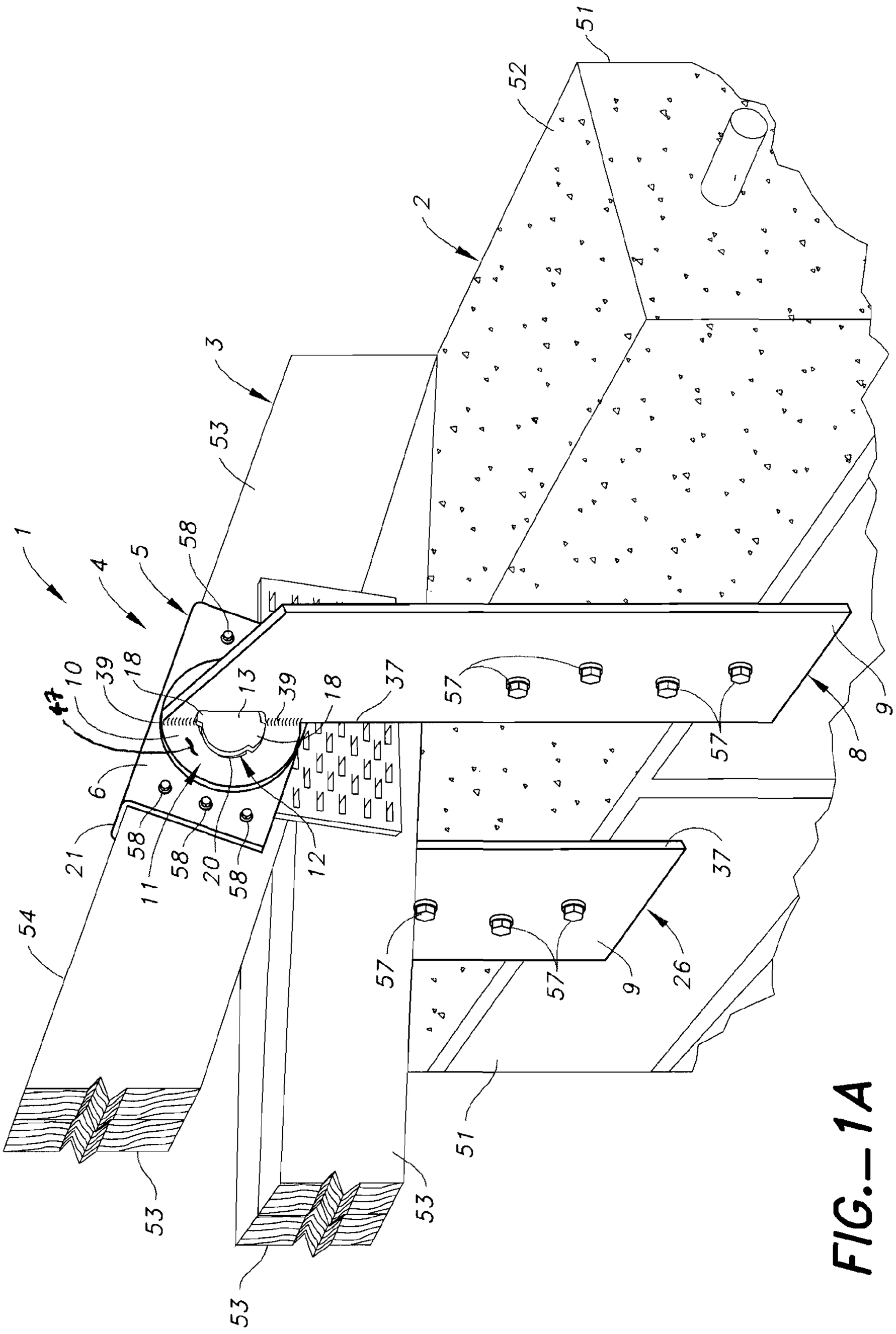
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FIG._1A

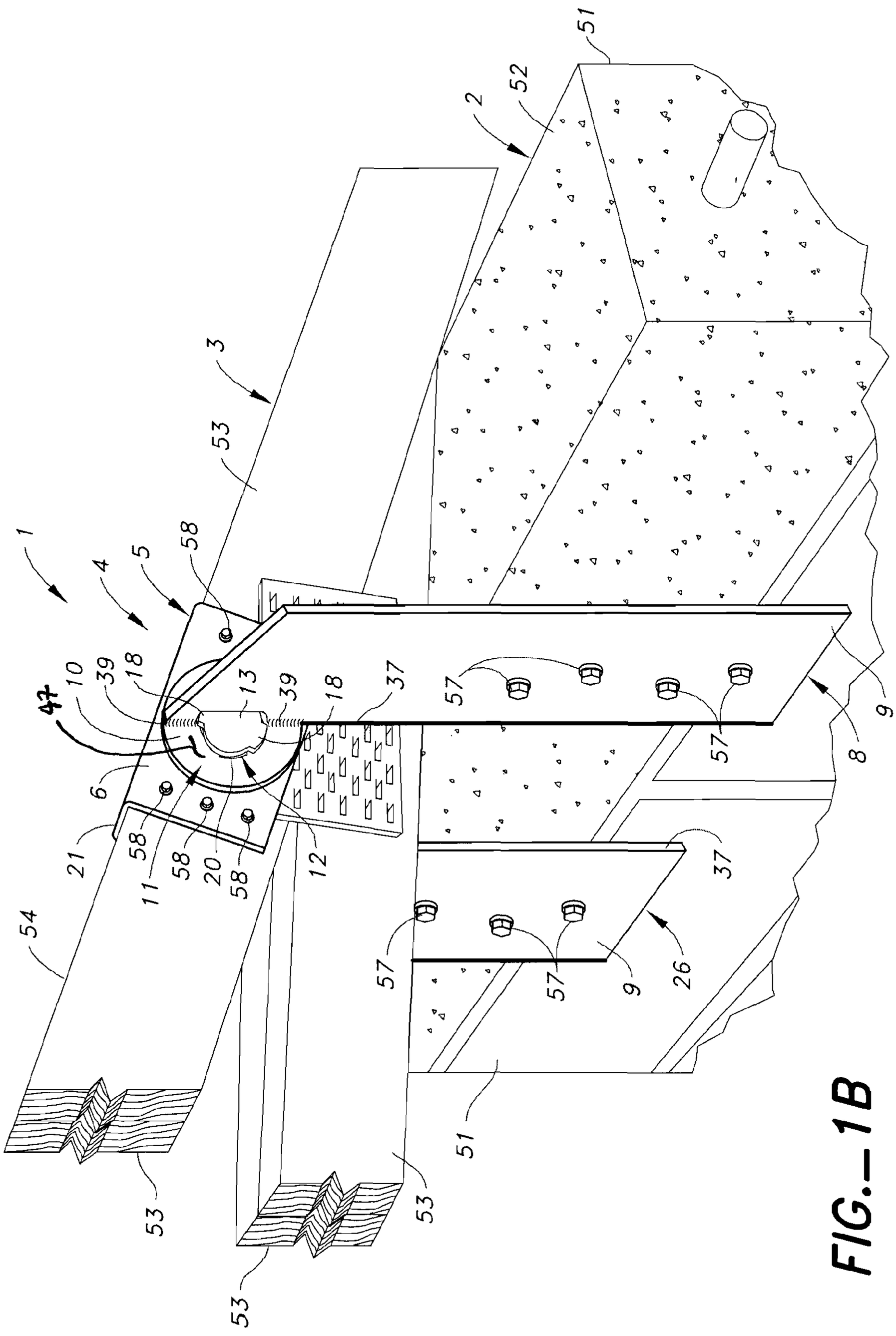
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FIG._1B

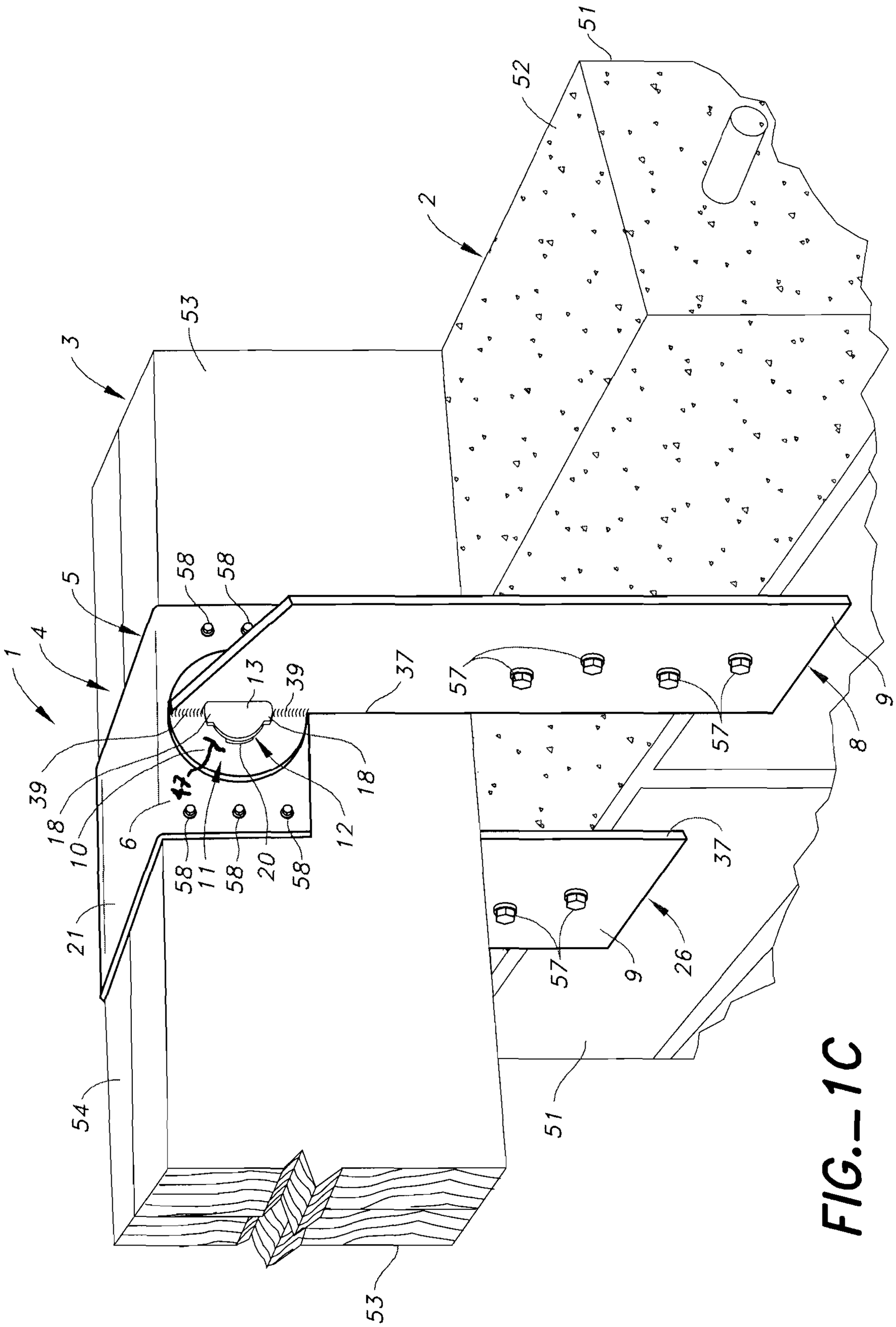
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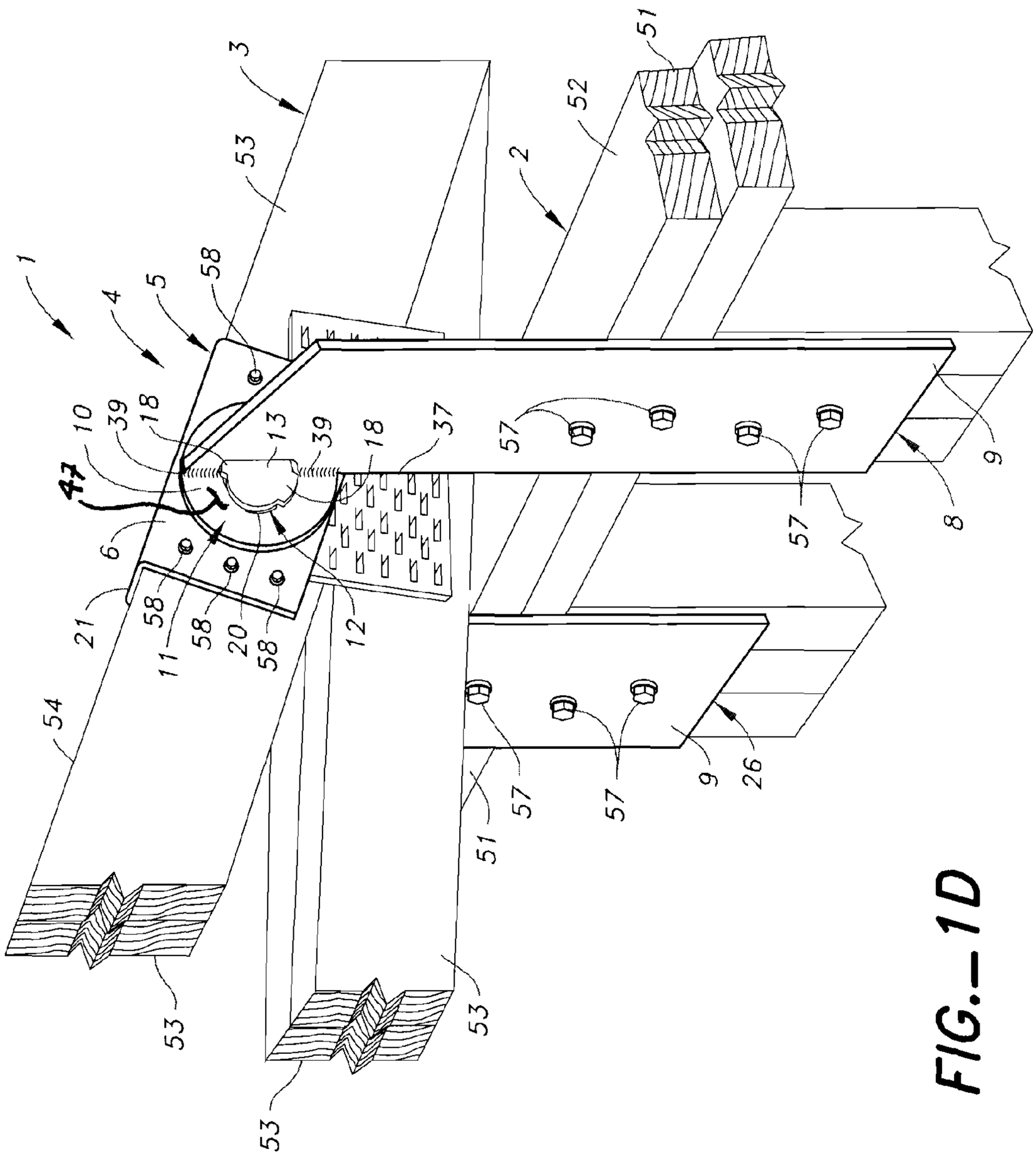
FIG._1C



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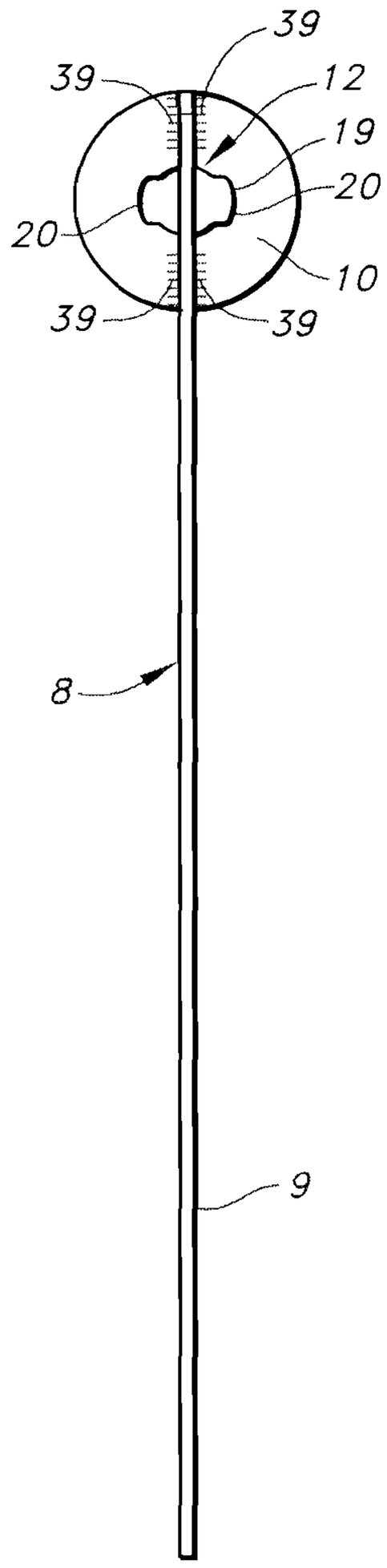


FIG._2

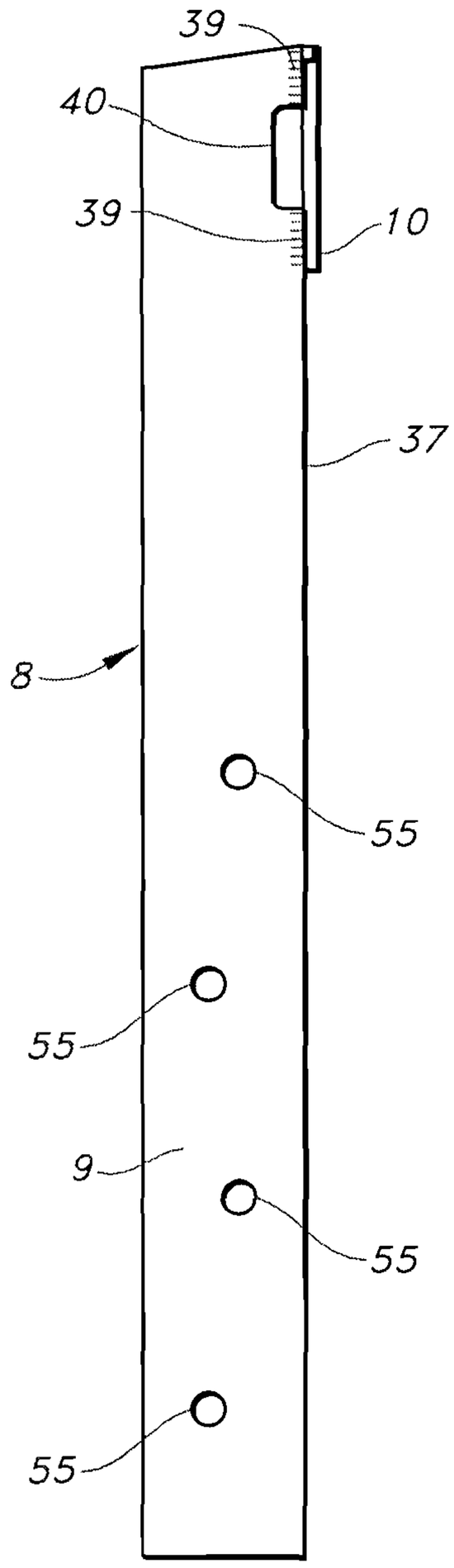
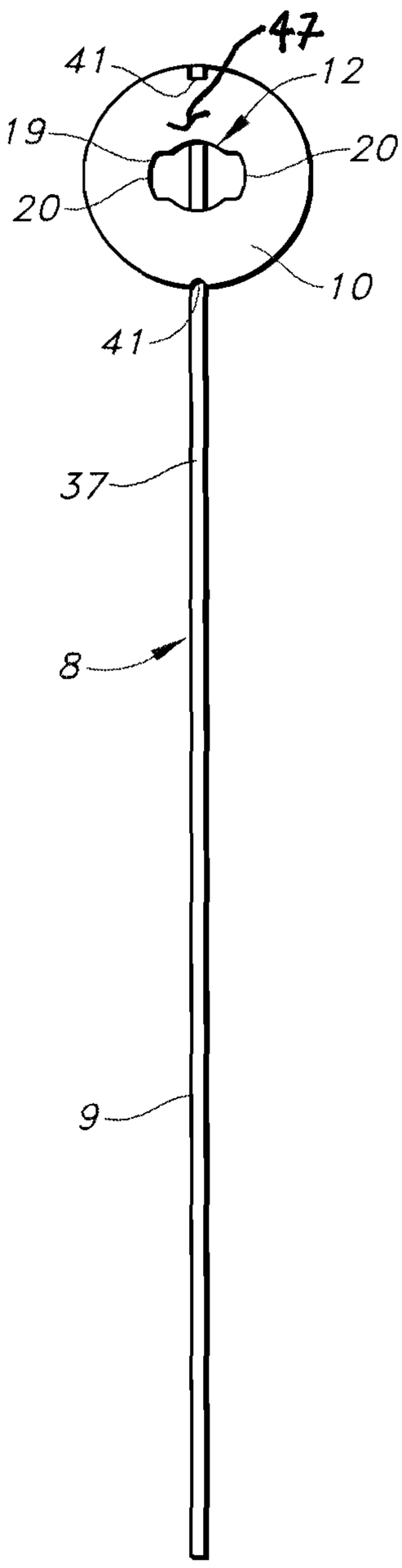


FIG._3



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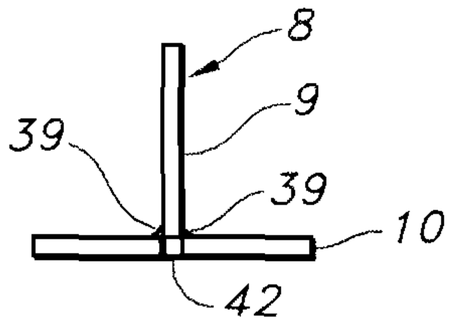

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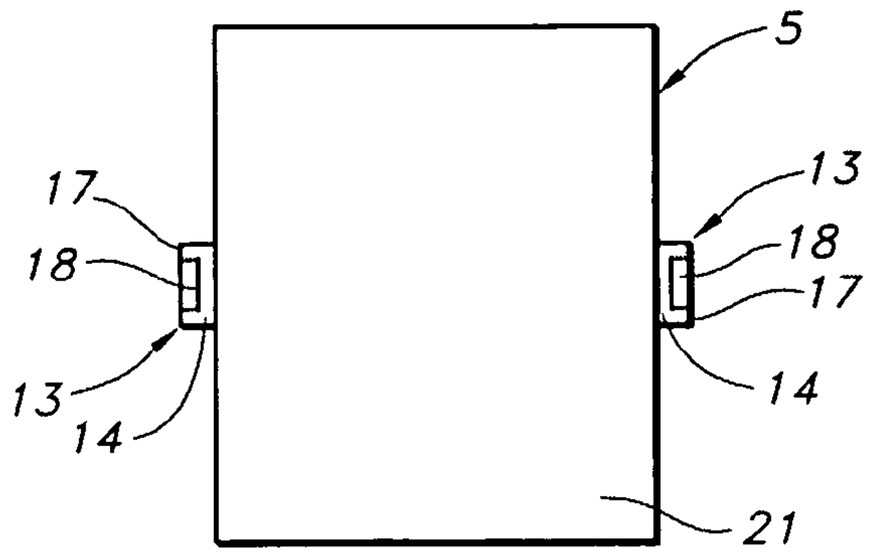

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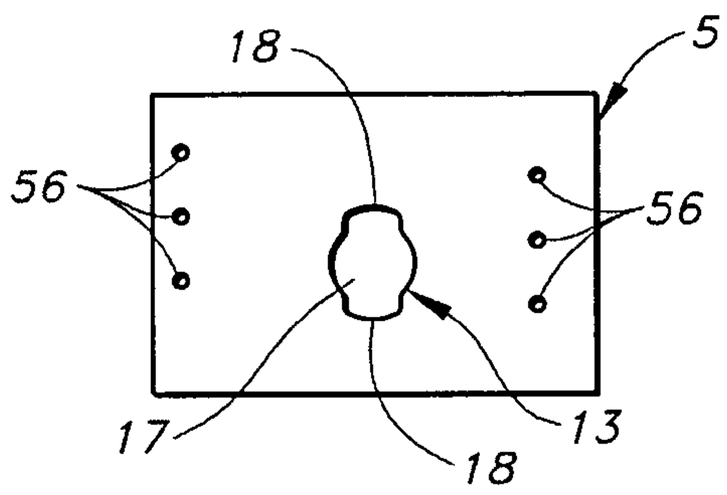


FIG._7

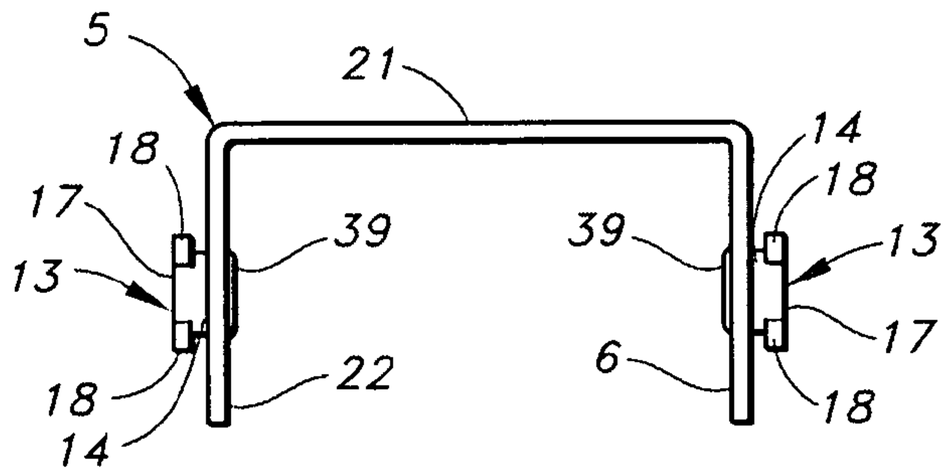


FIG._8

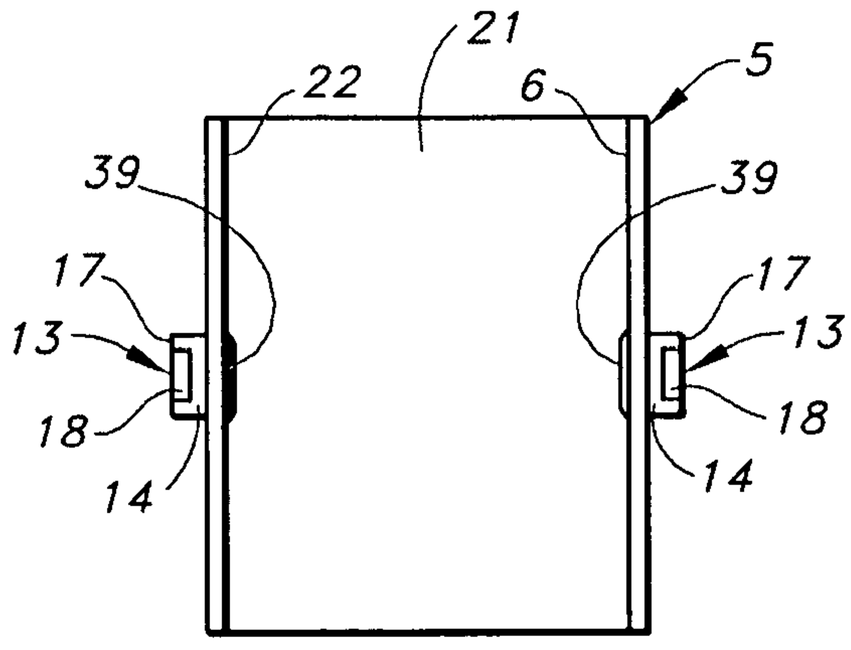


FIG._9

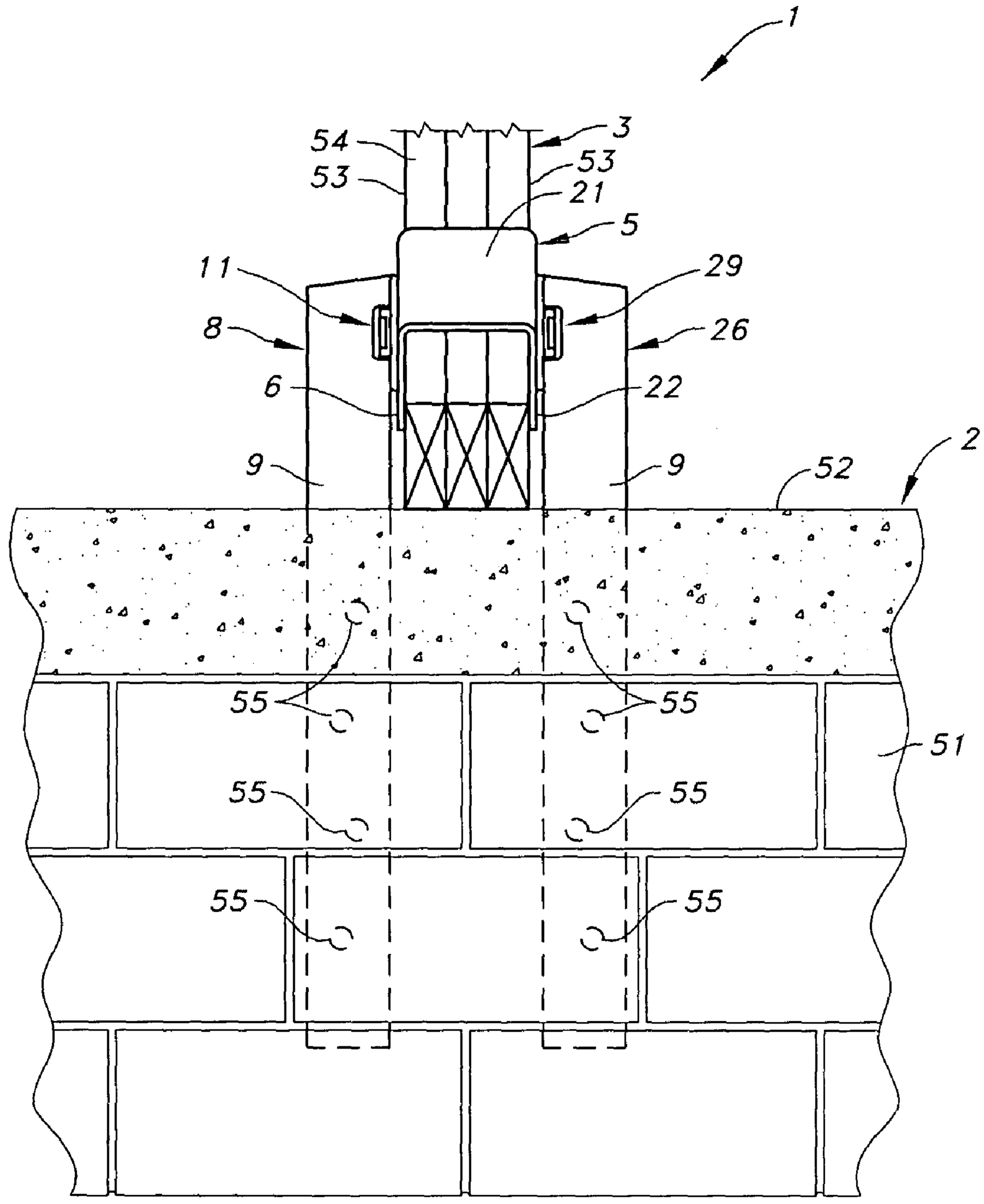
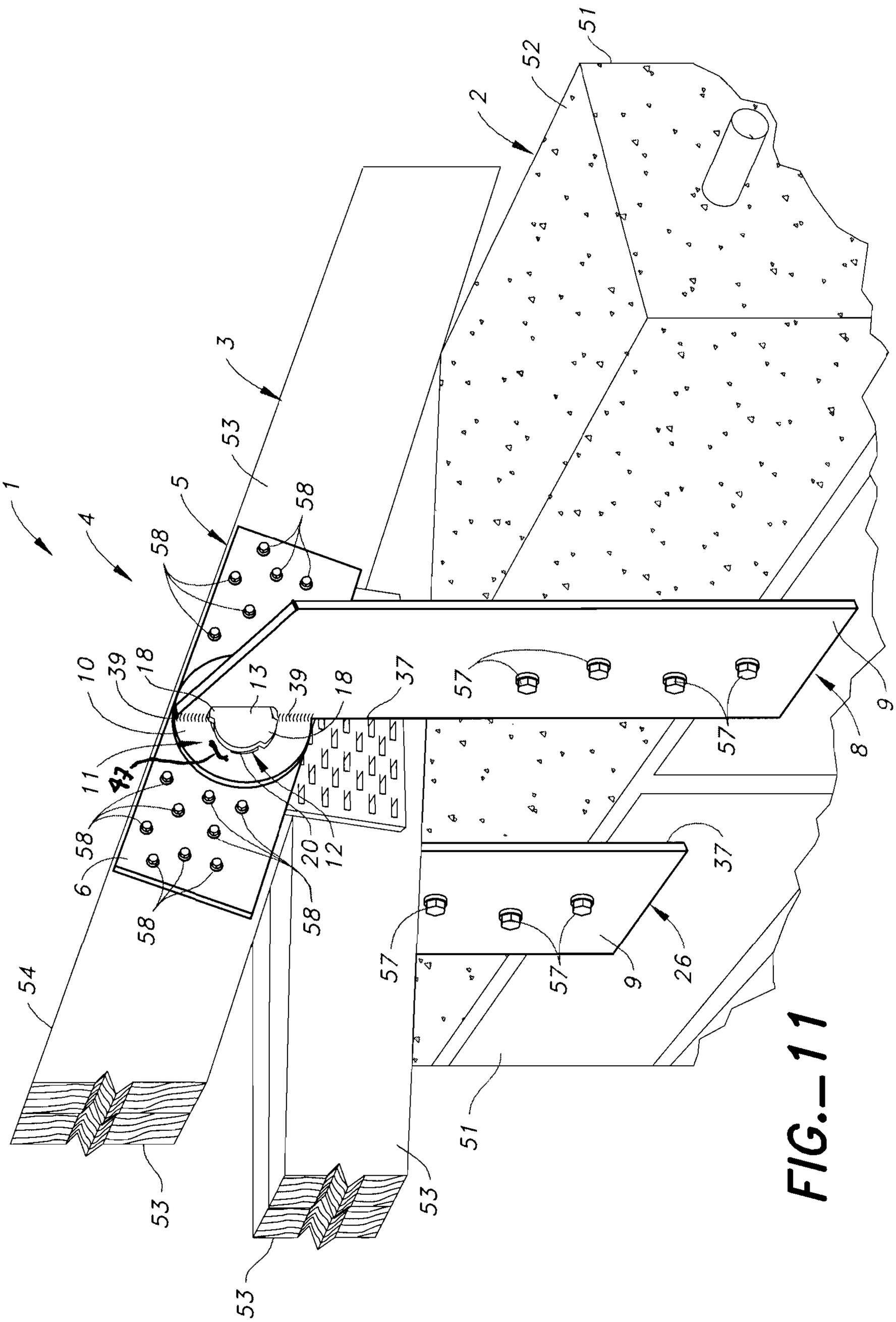


FIG._10



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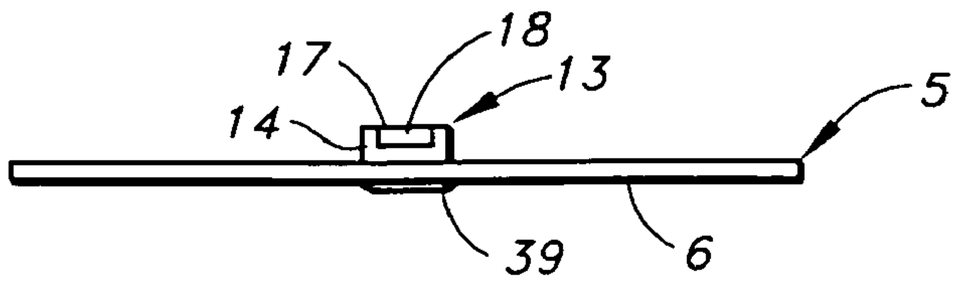

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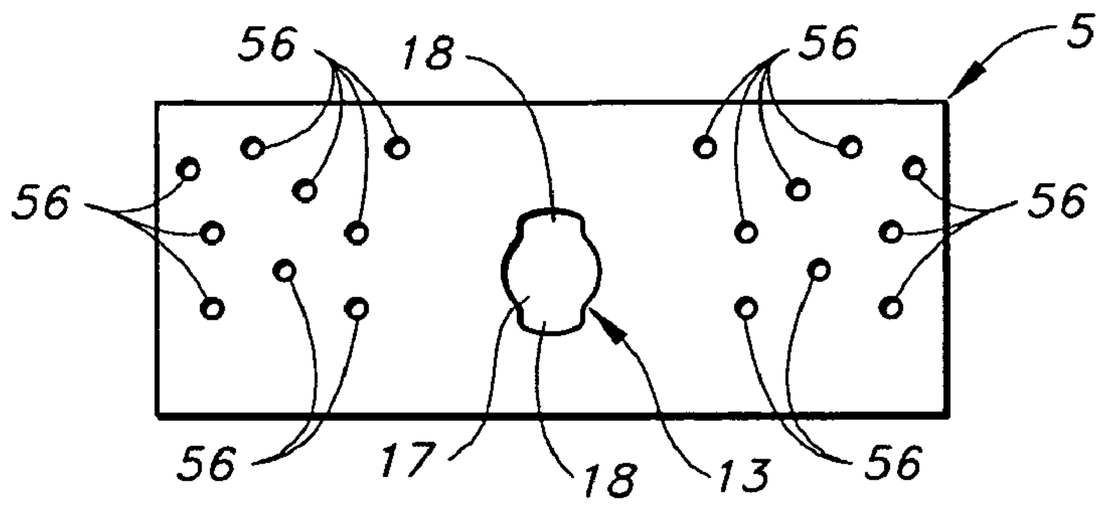

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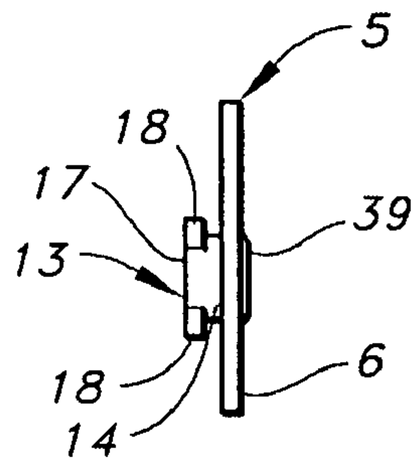

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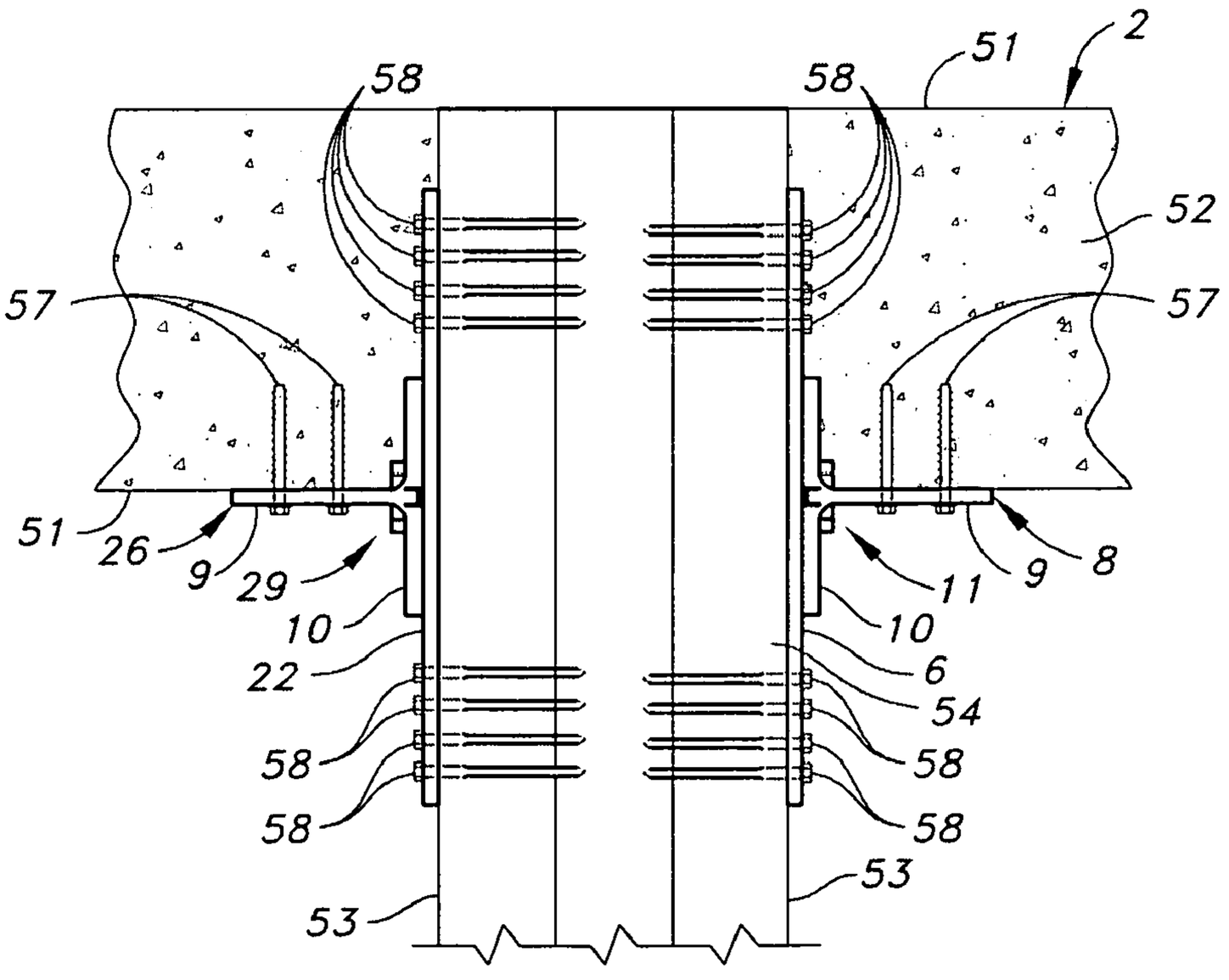

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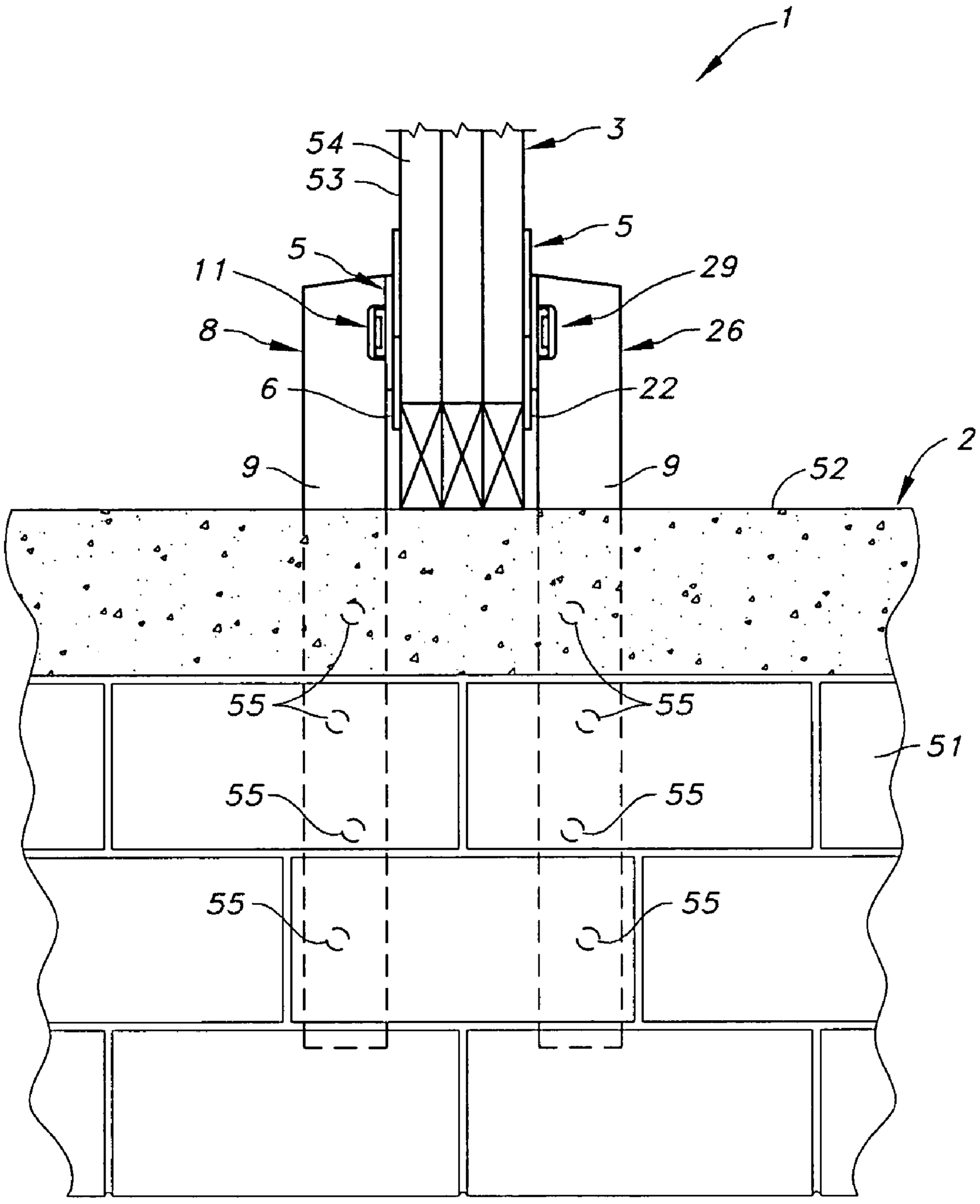

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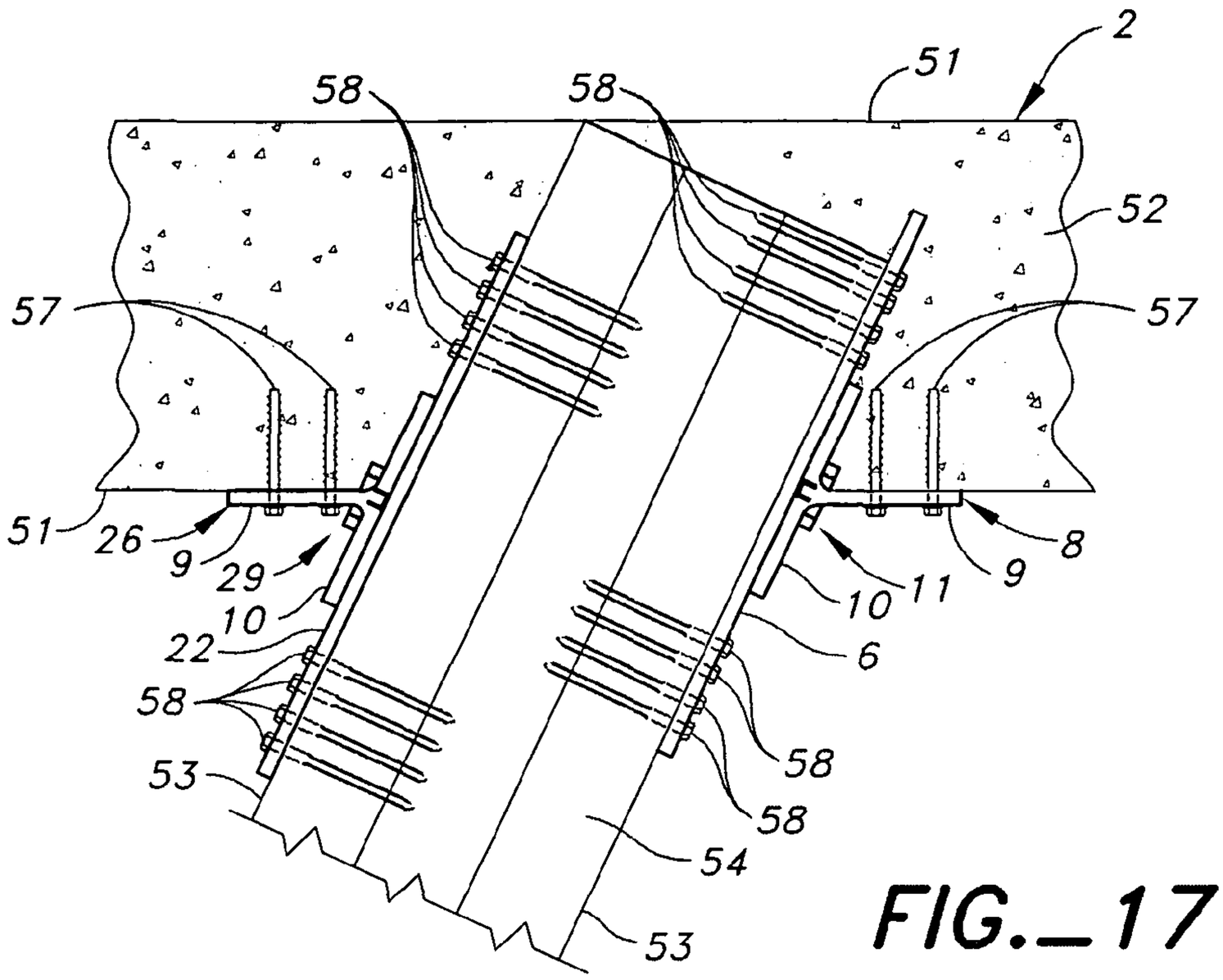
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FIG._17

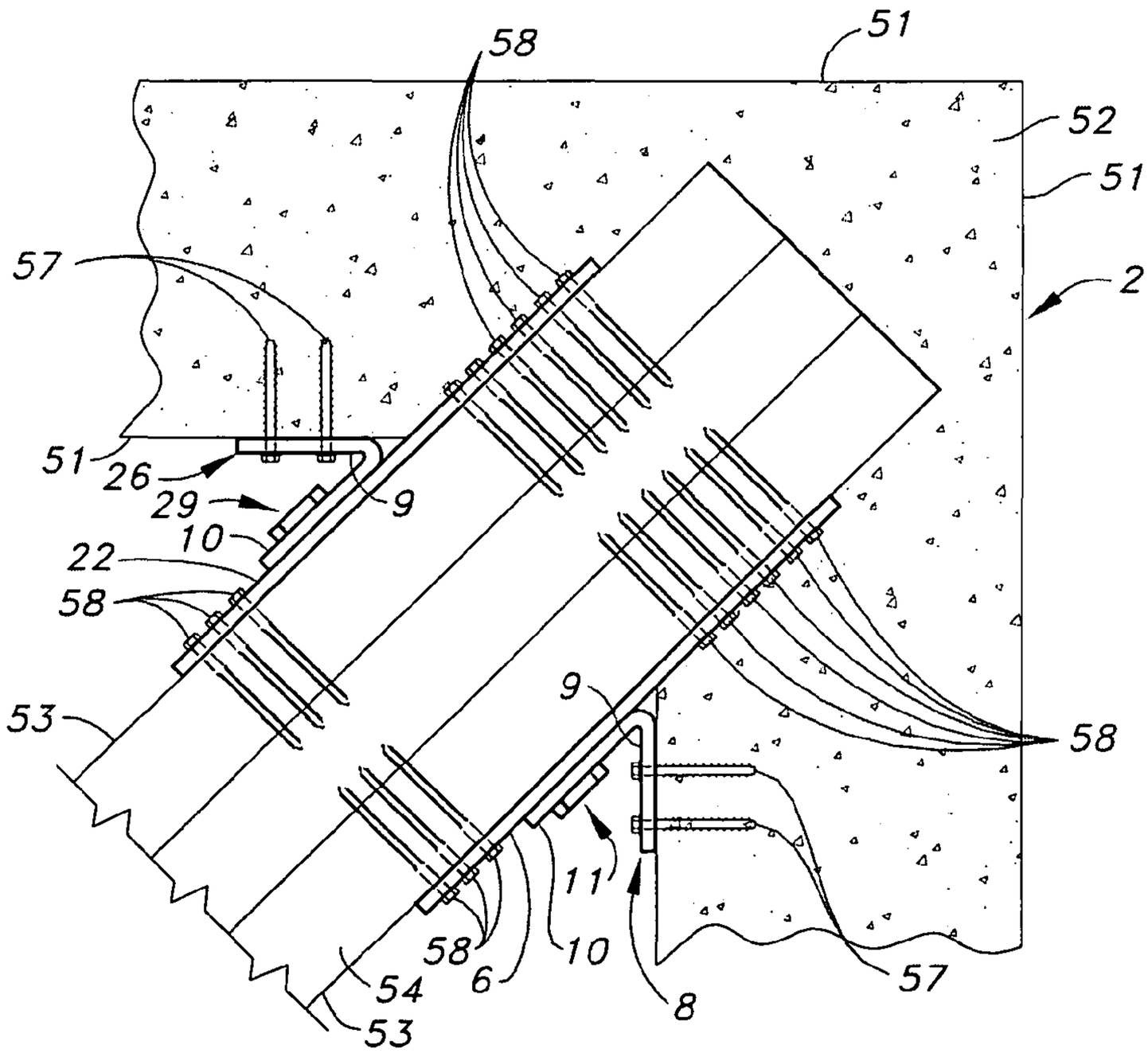
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FIG._18

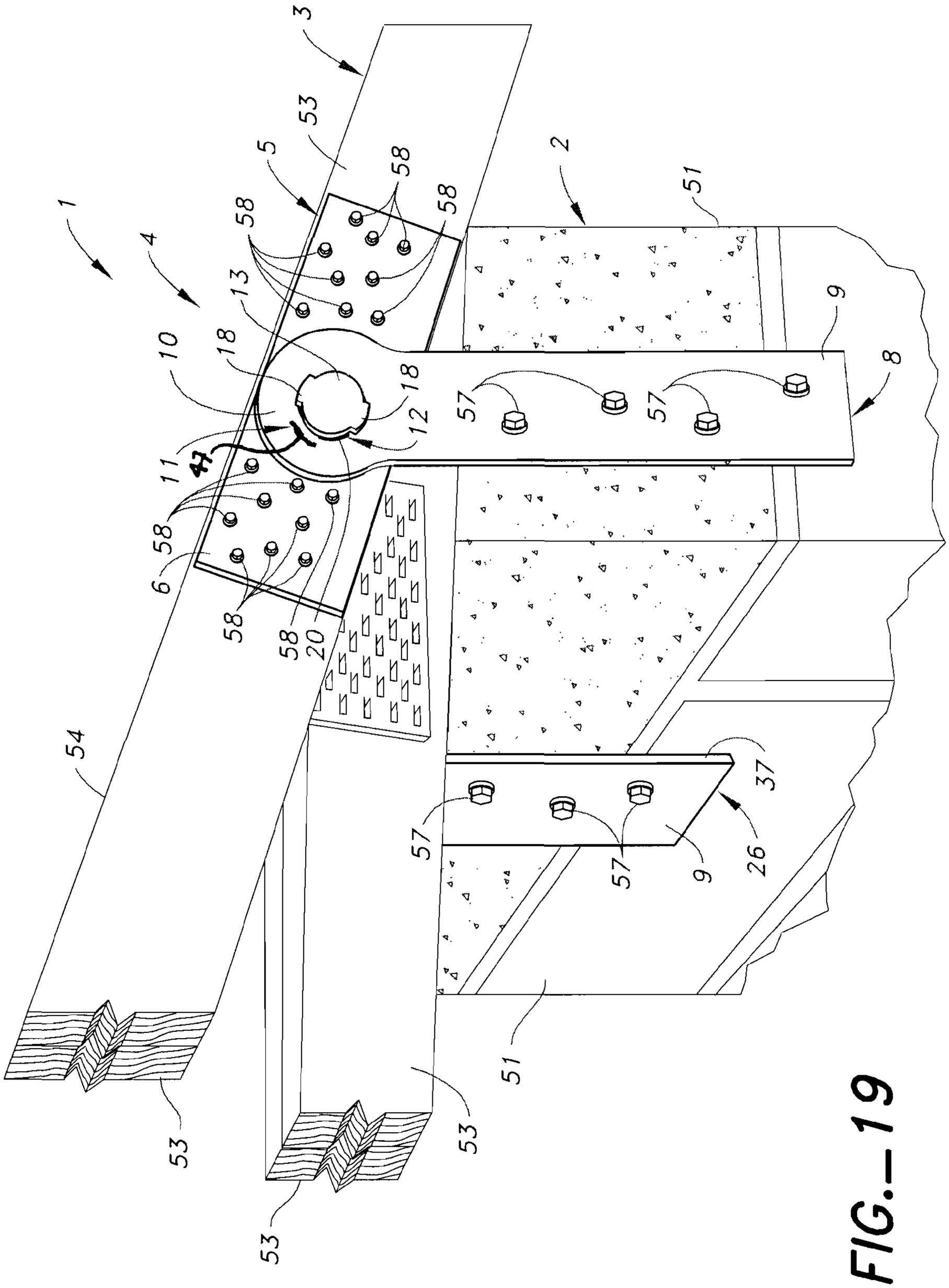
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FIG._19

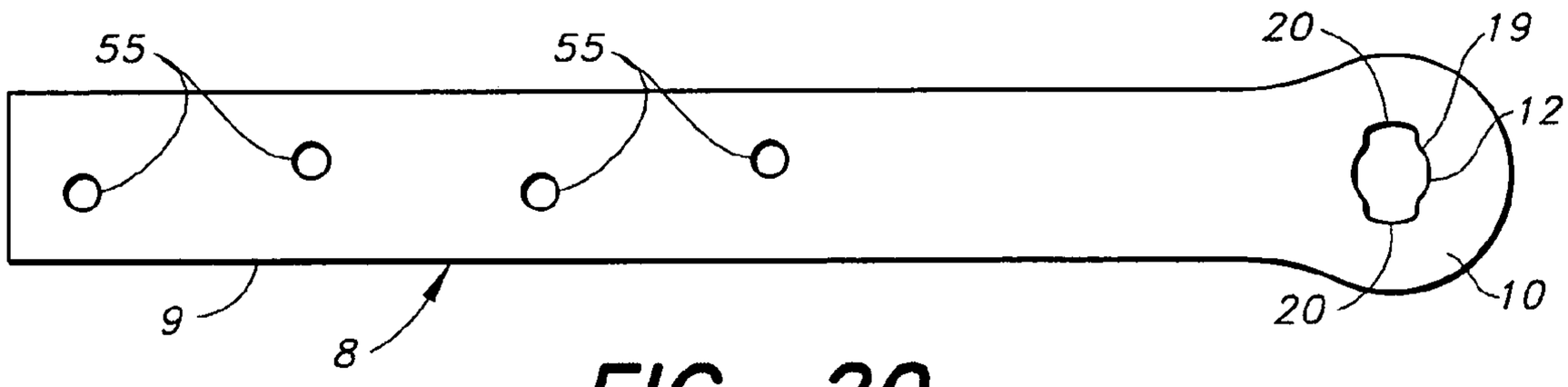
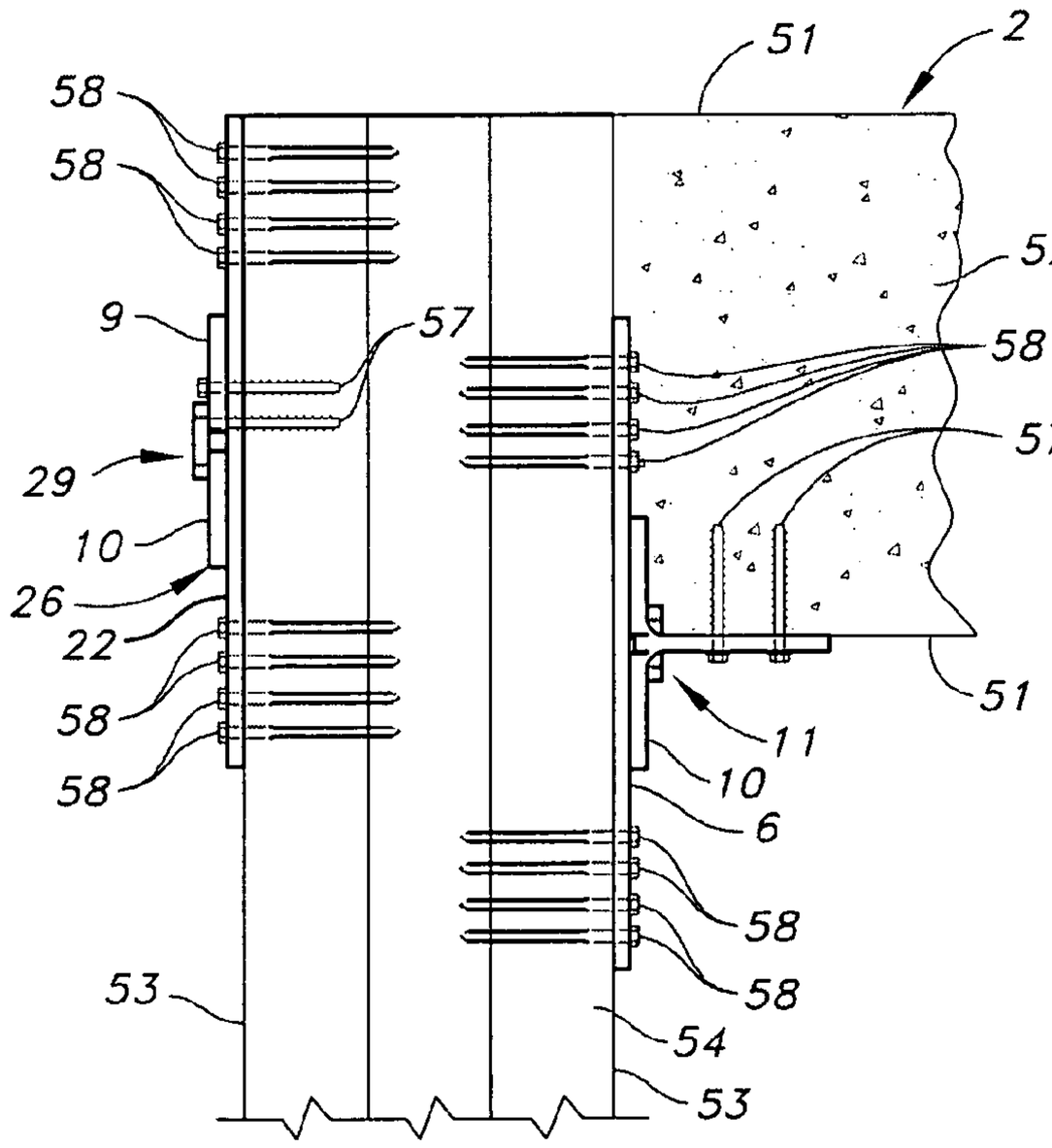


FIG._20

FIG._21



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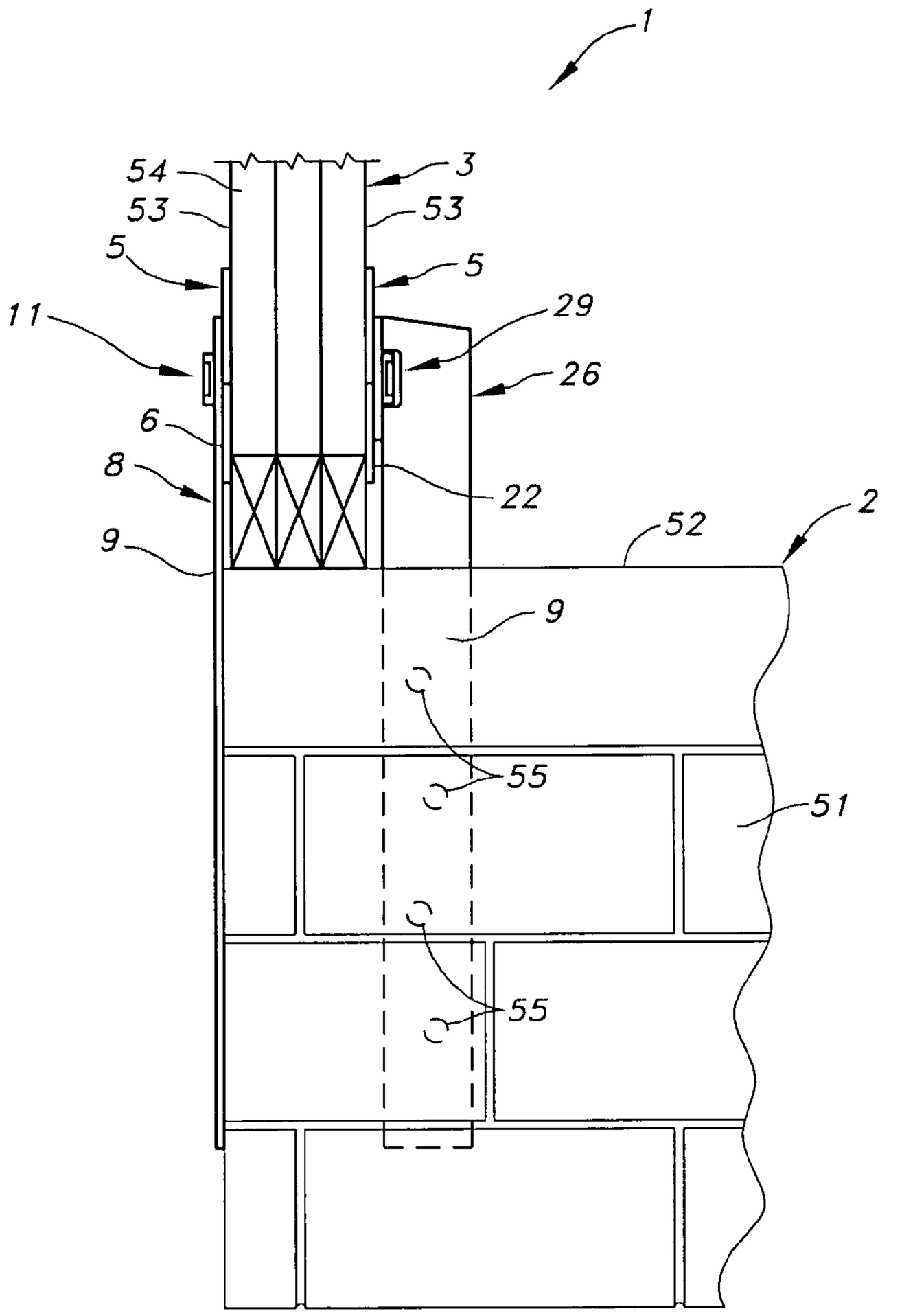

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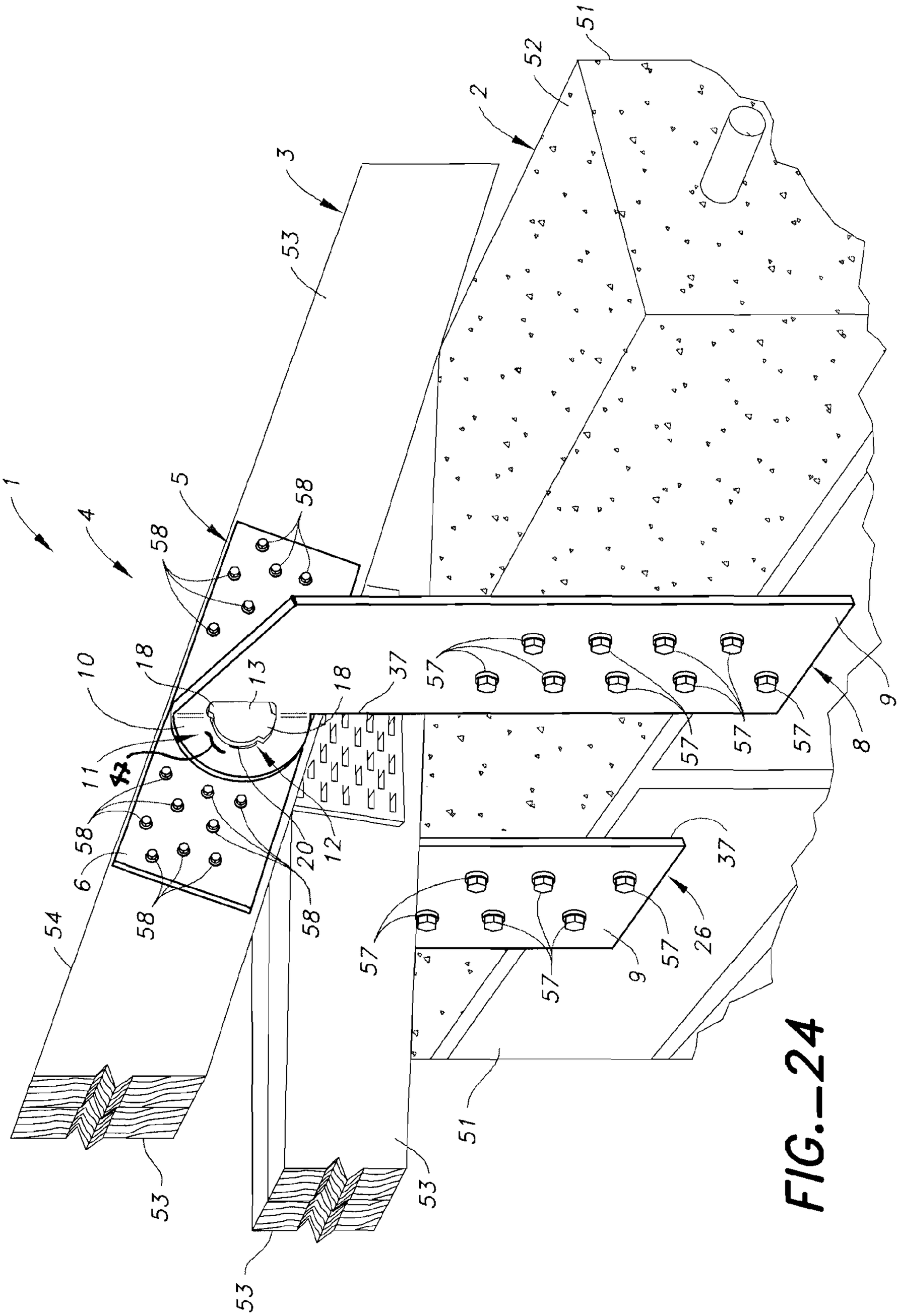

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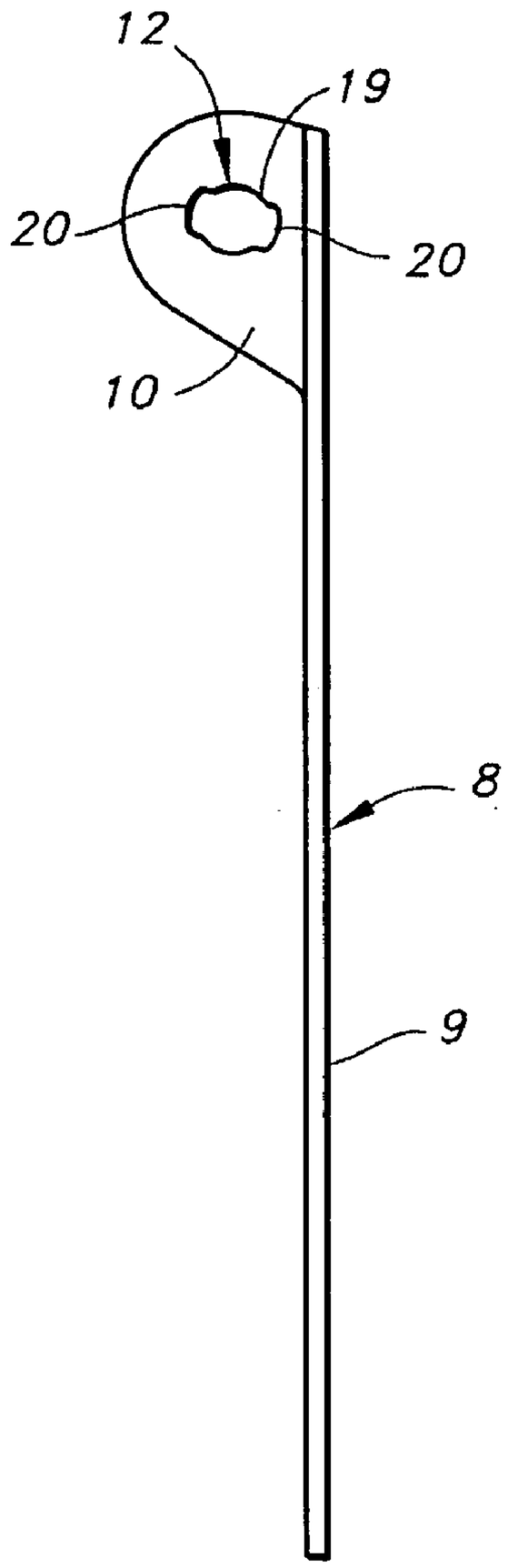
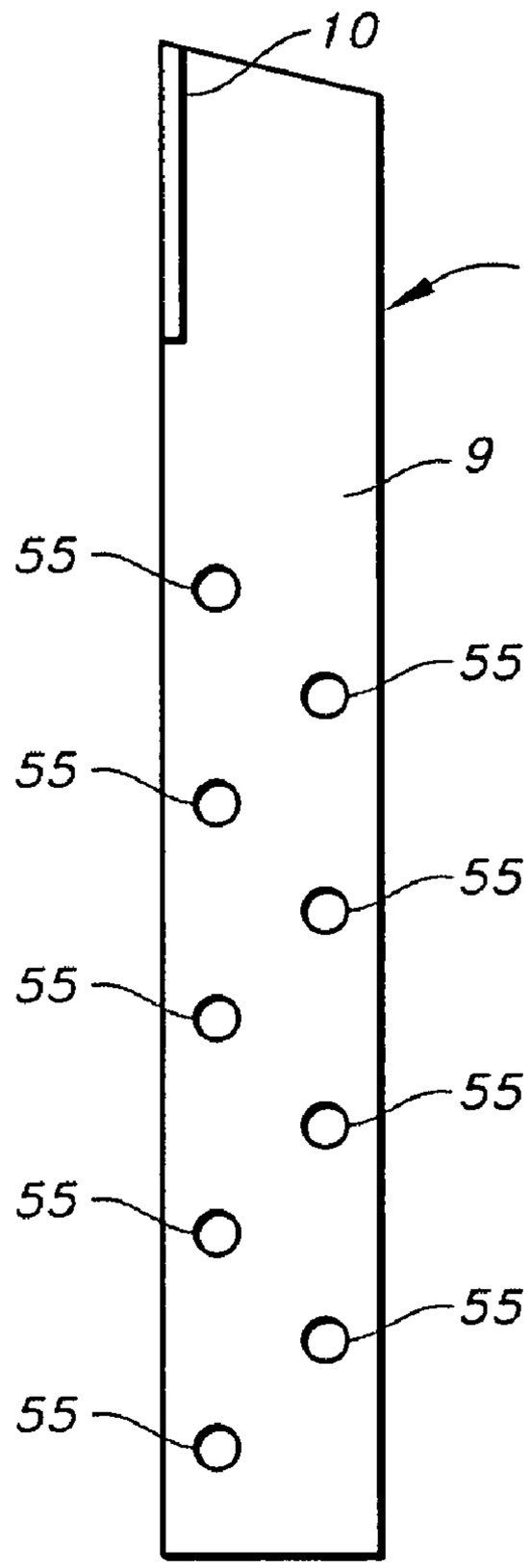


FIG._25



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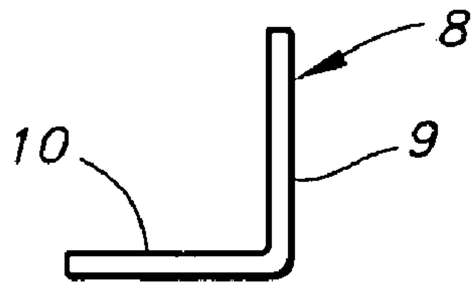

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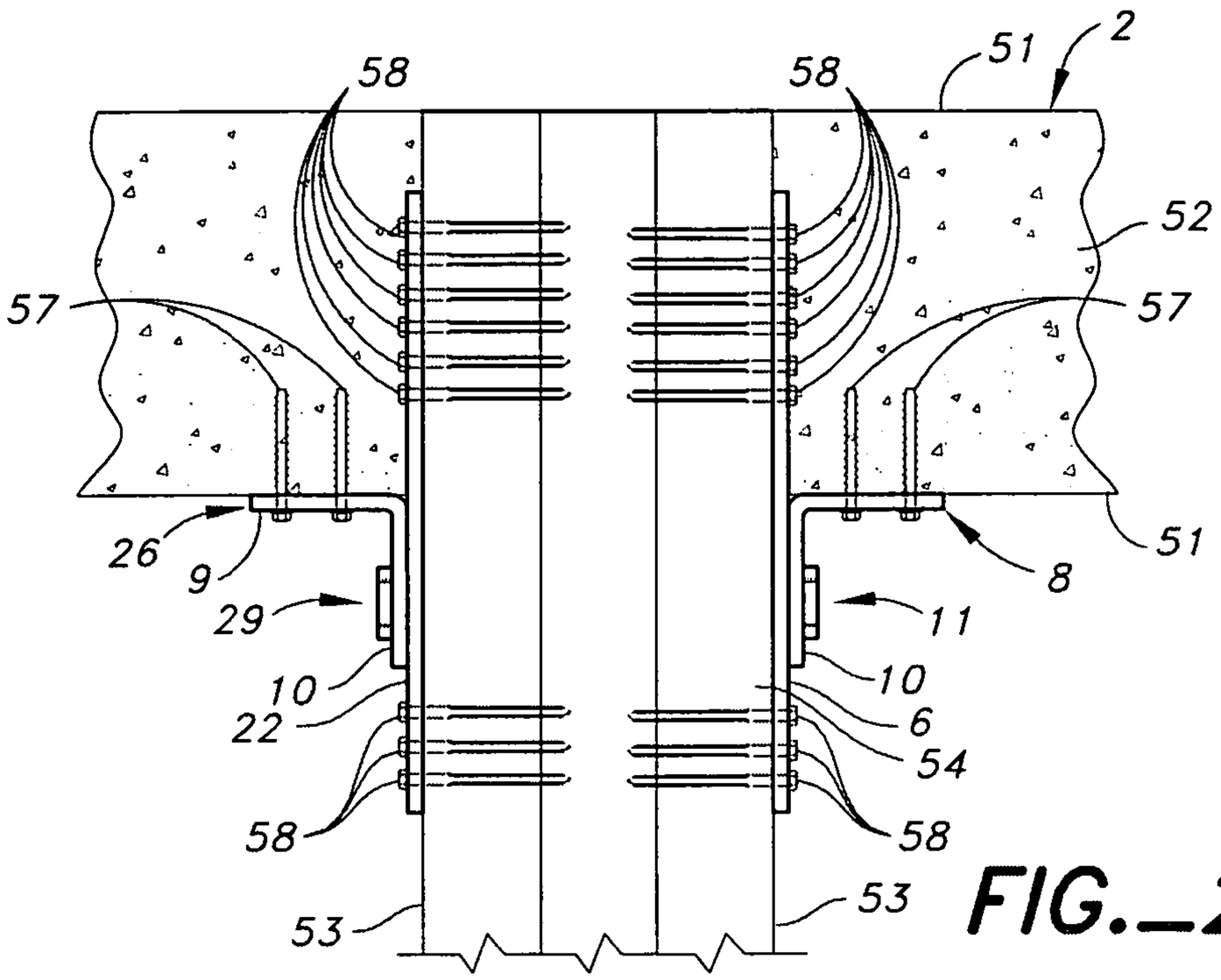

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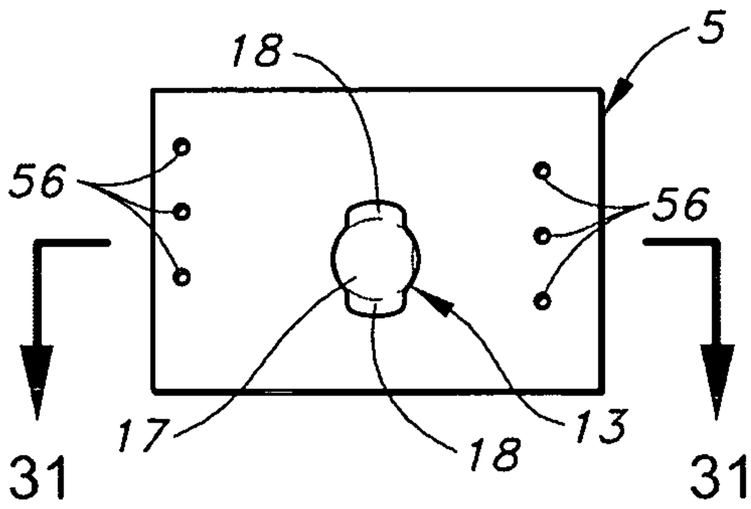

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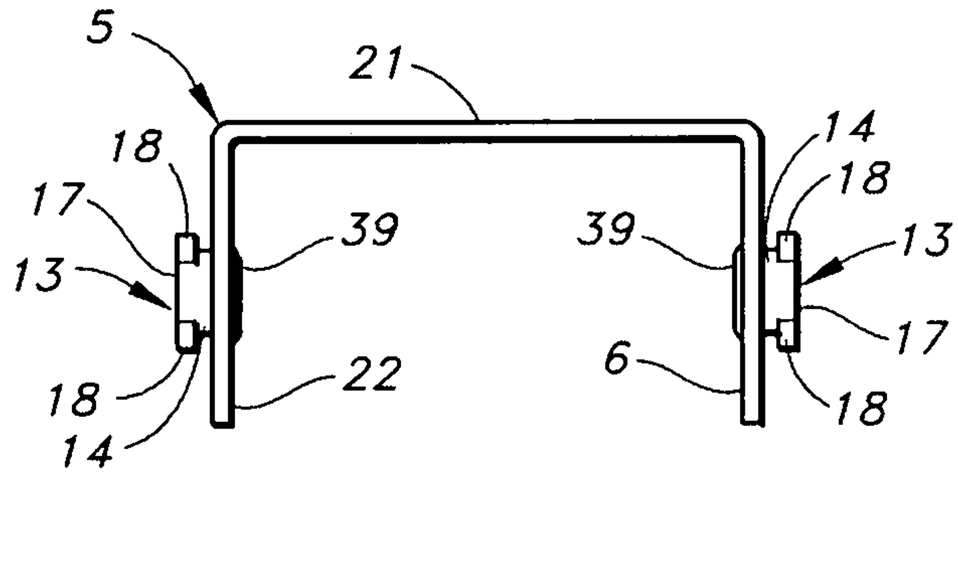

FIG._31

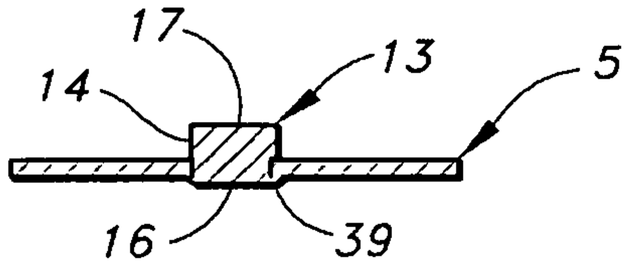

FIG._32

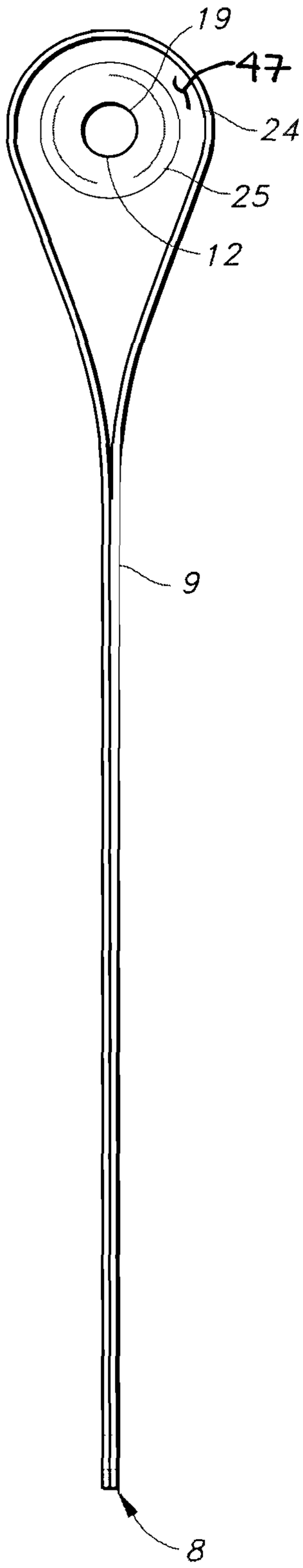

FIG._29

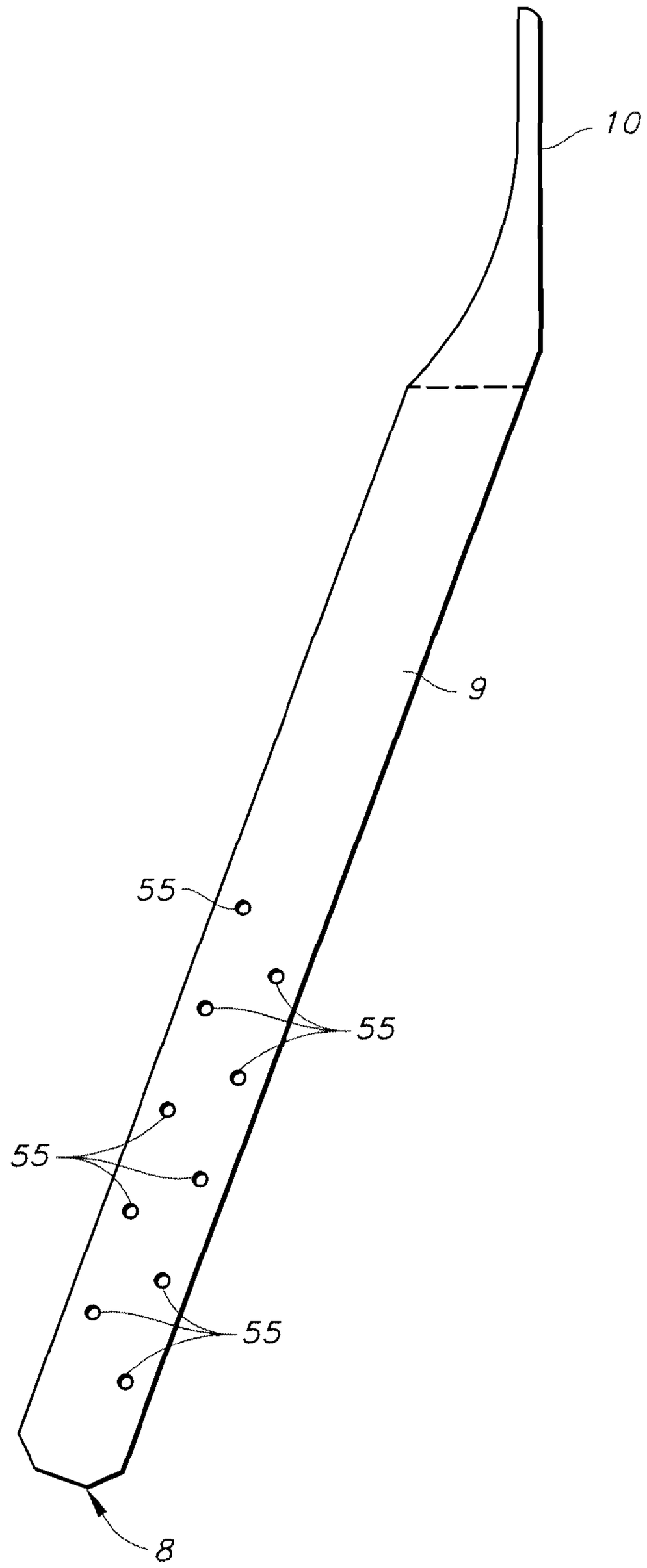

FIG._34

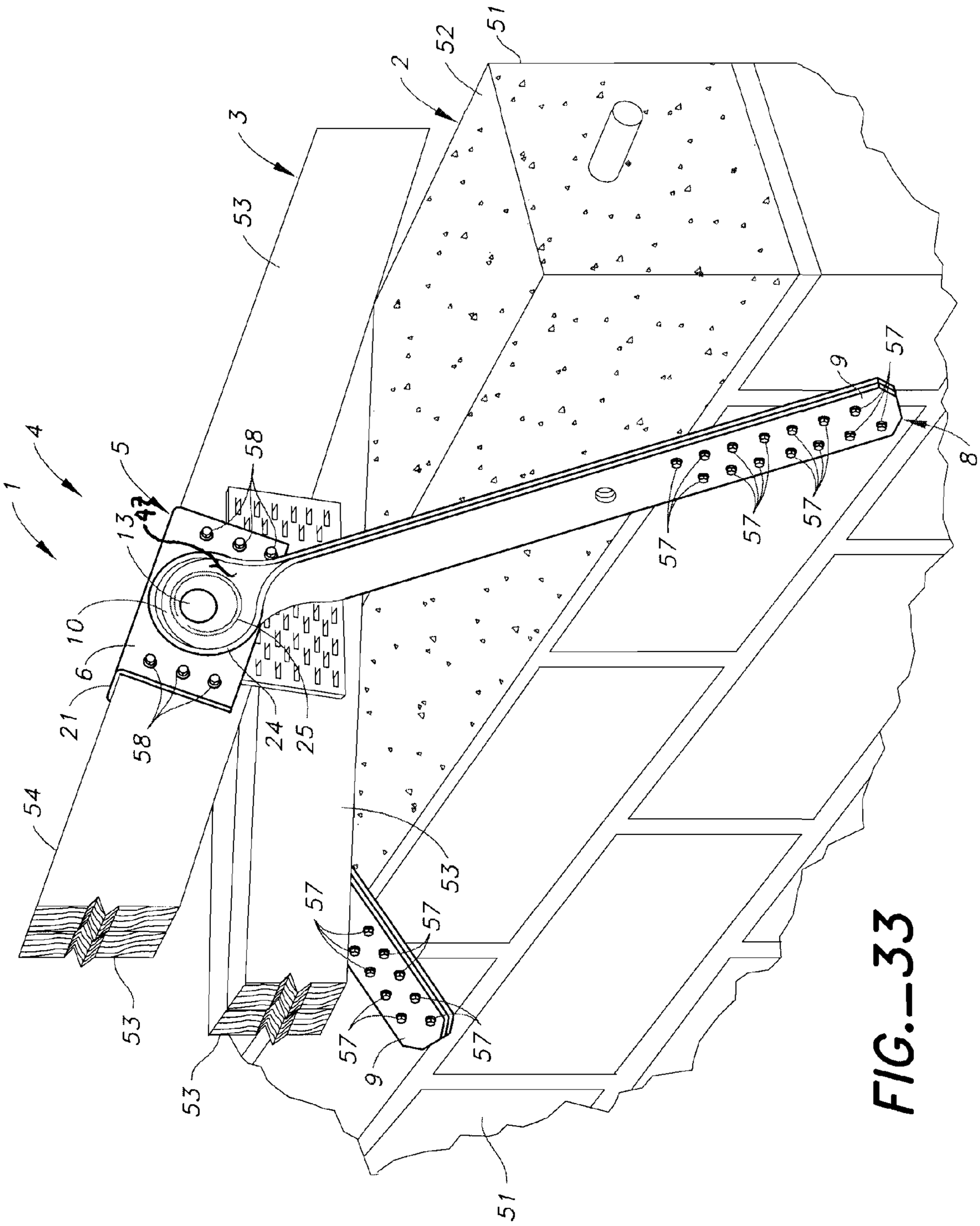

FIG._33

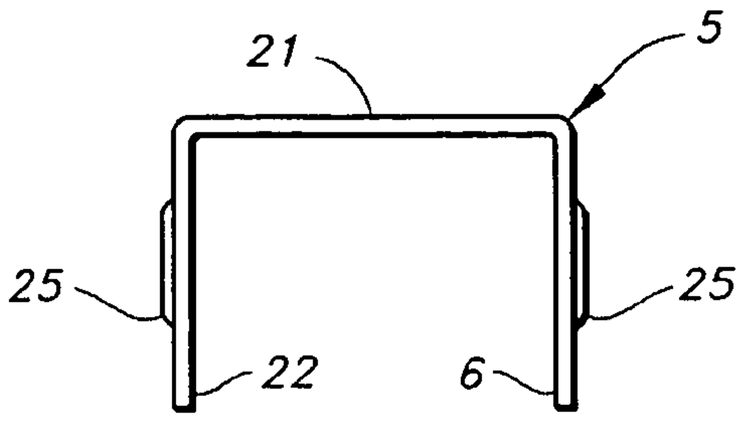

FIG._35

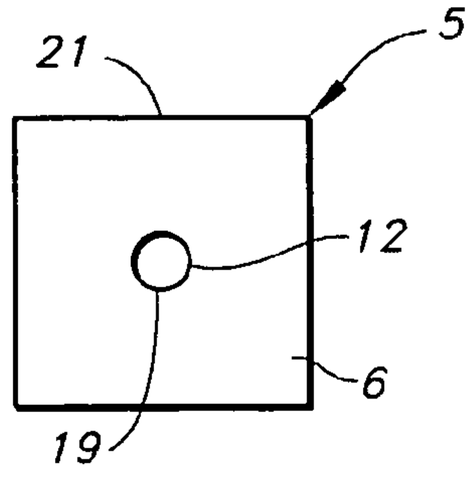

FIG._36

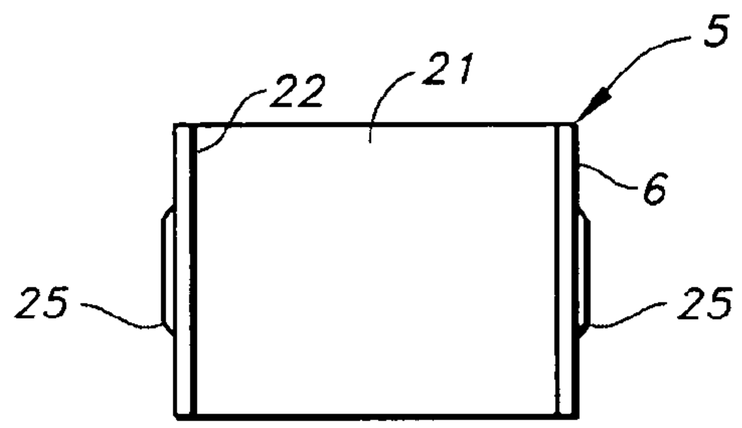

FIG._37

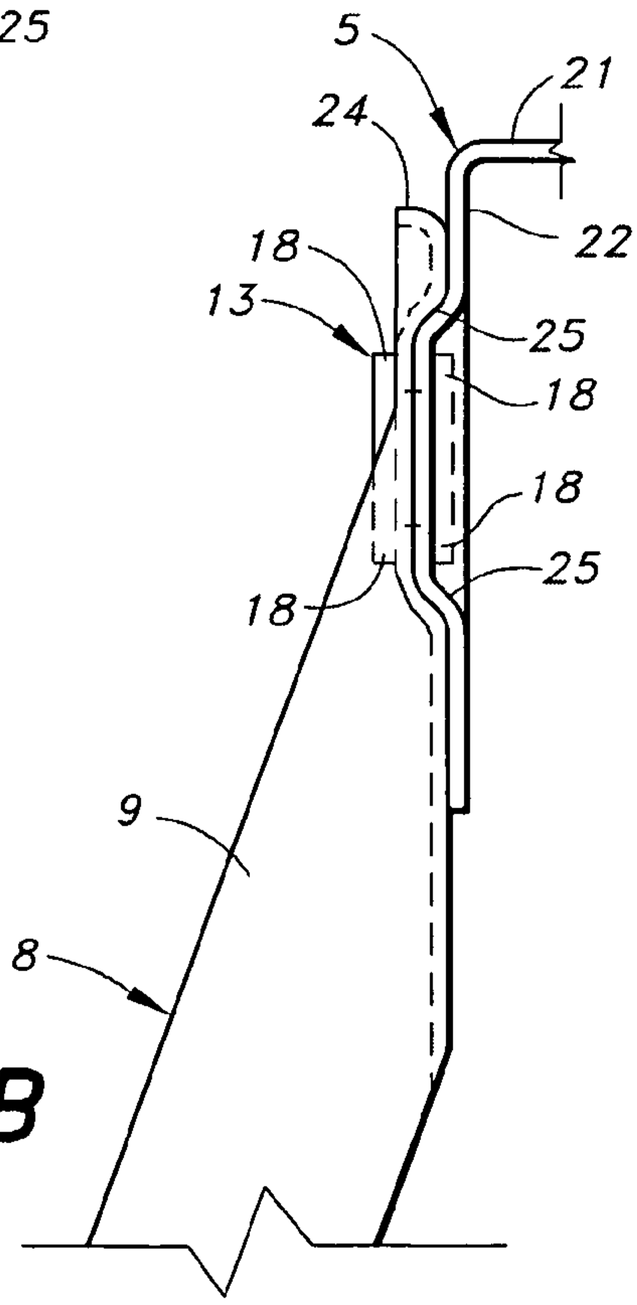

FIG._38B

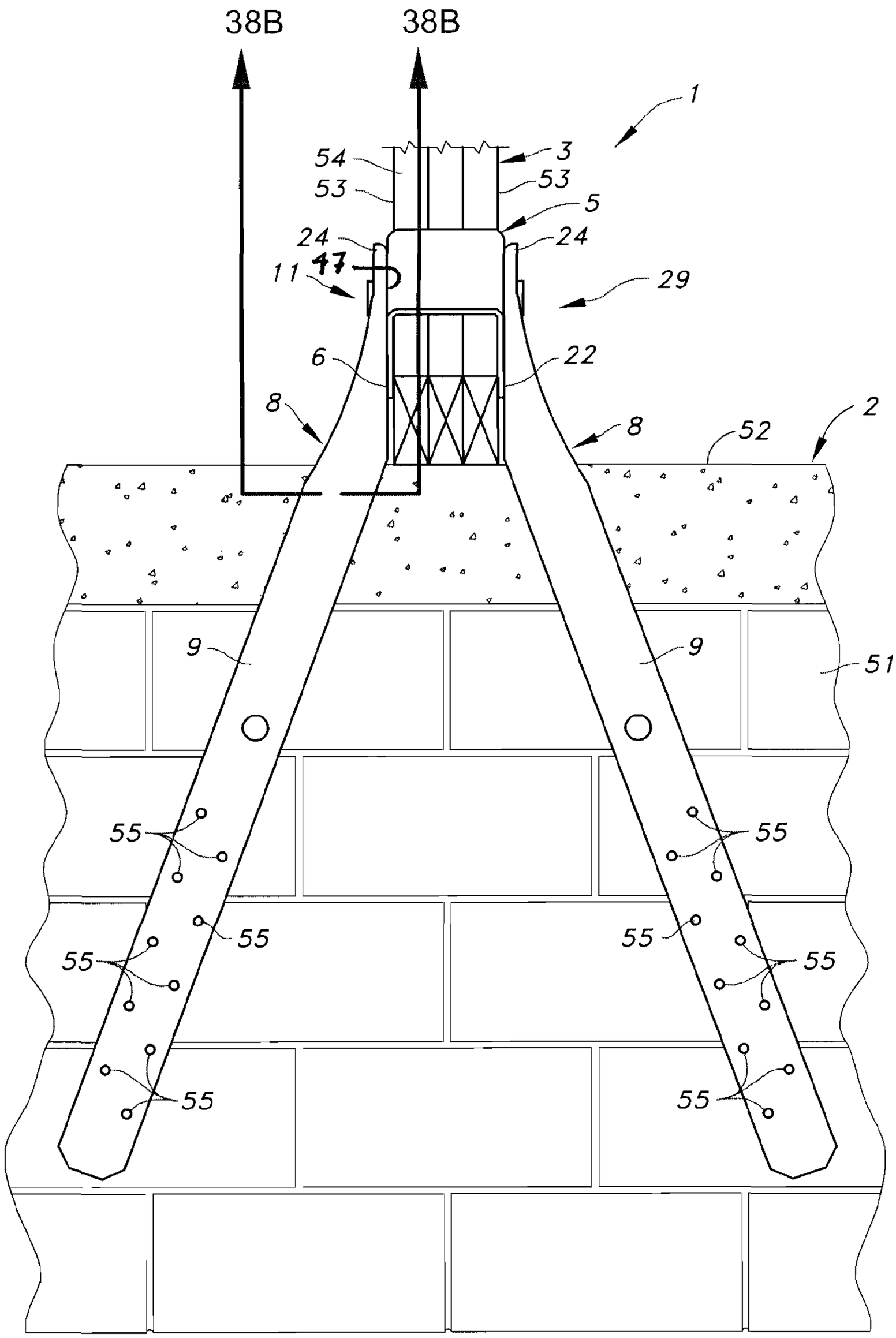
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FIG._38A

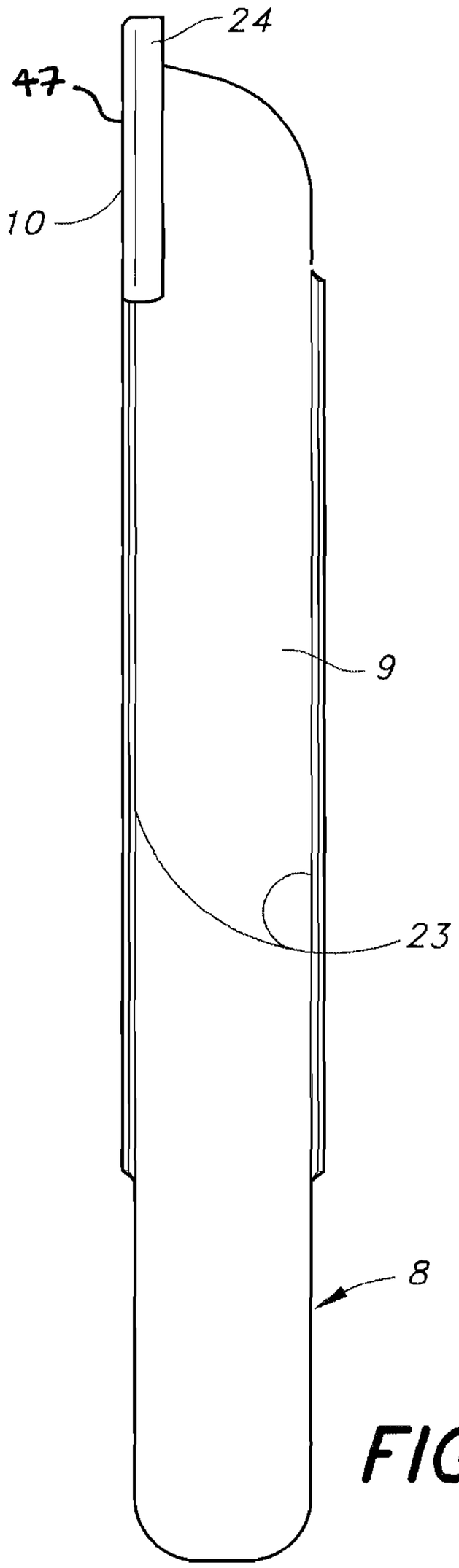

FIG._39

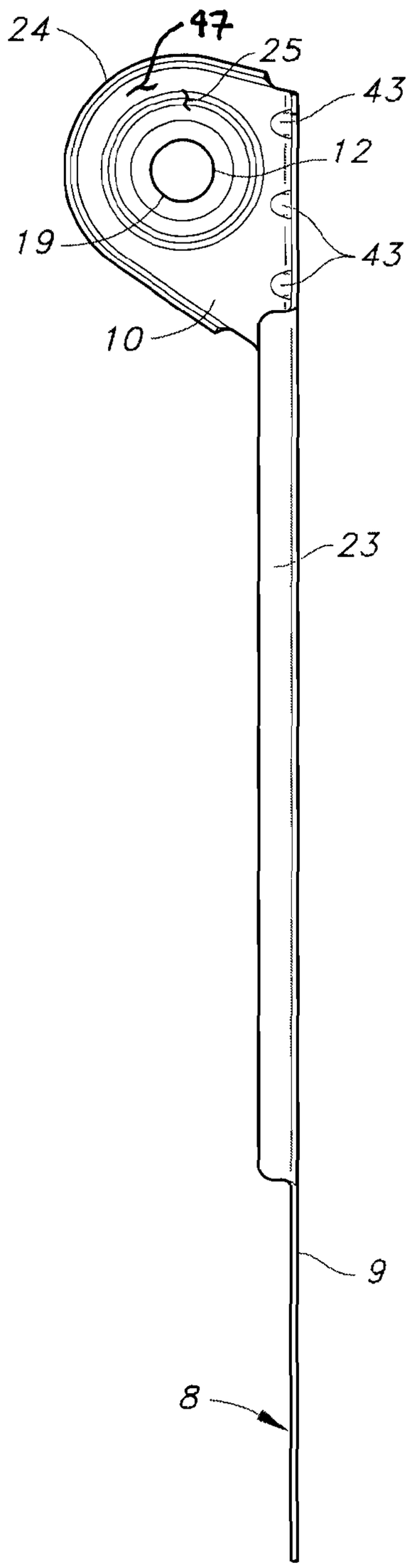

FIG._40

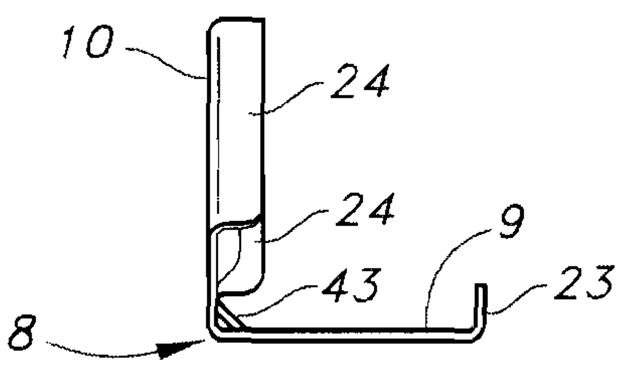

FIG._41

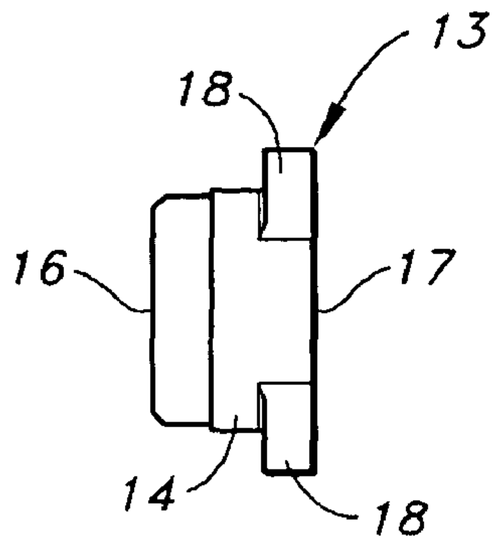

FIG._42

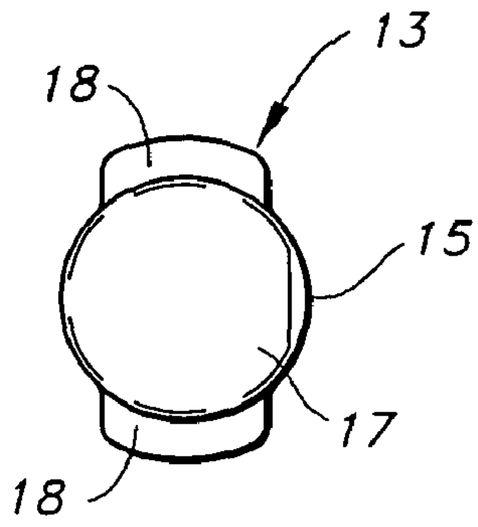

FIG._44

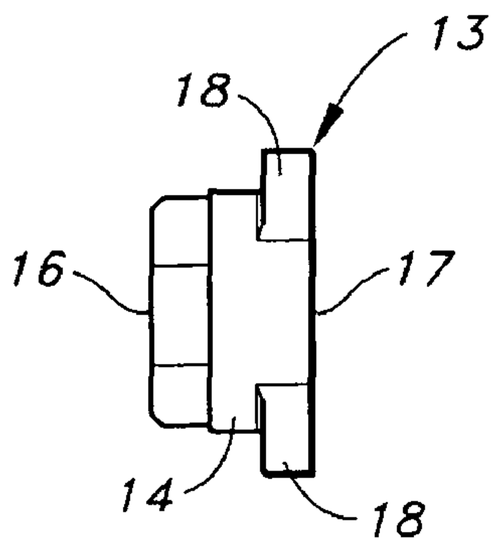

FIG._43

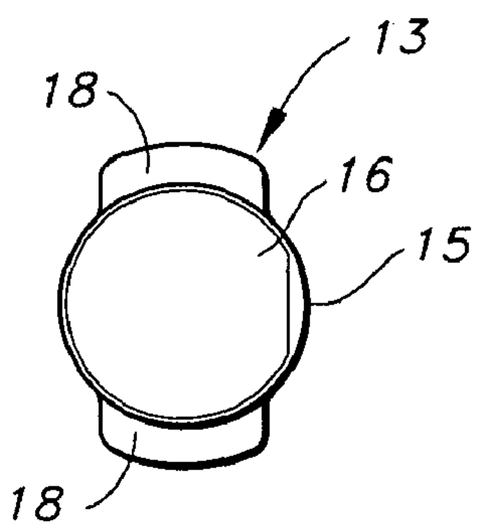

FIG._45

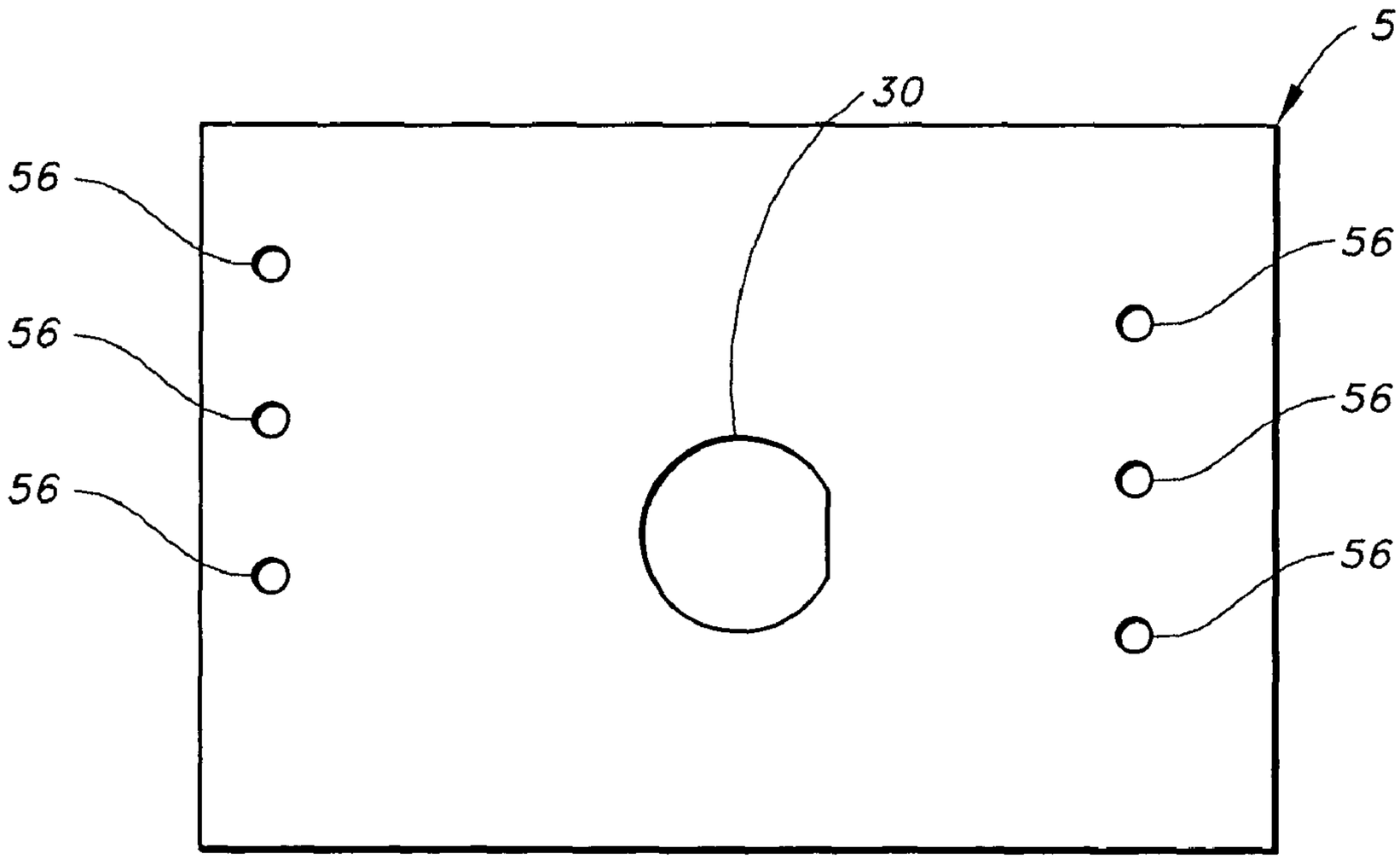

FIG._46

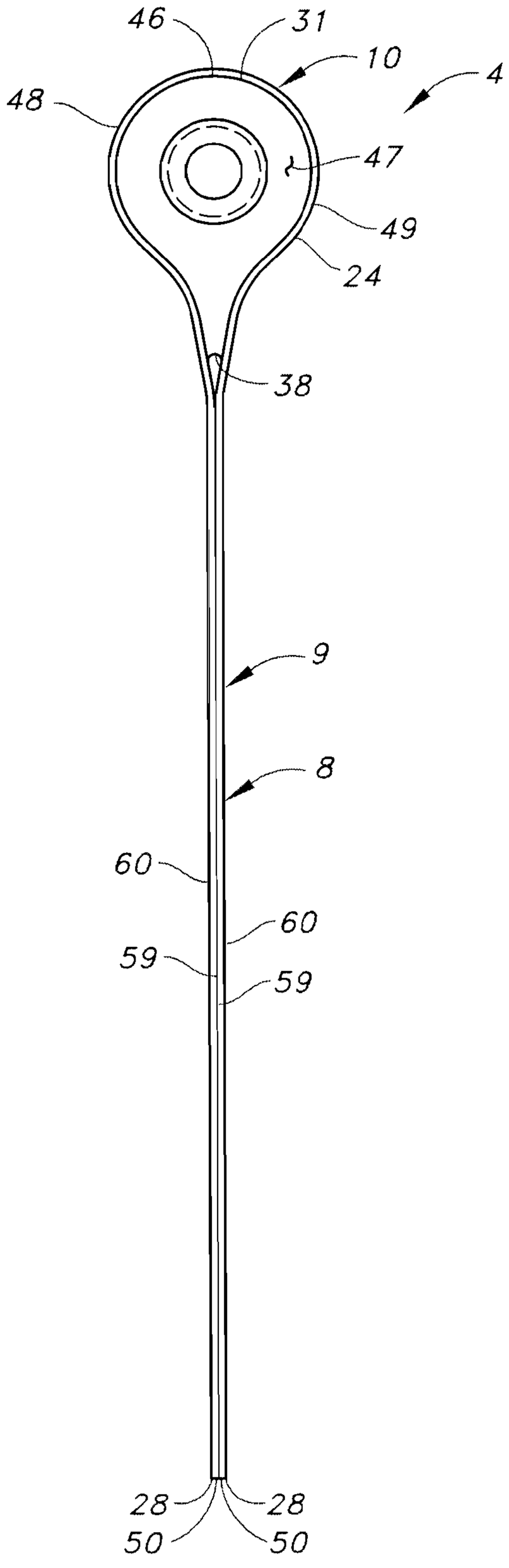
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FIG._47

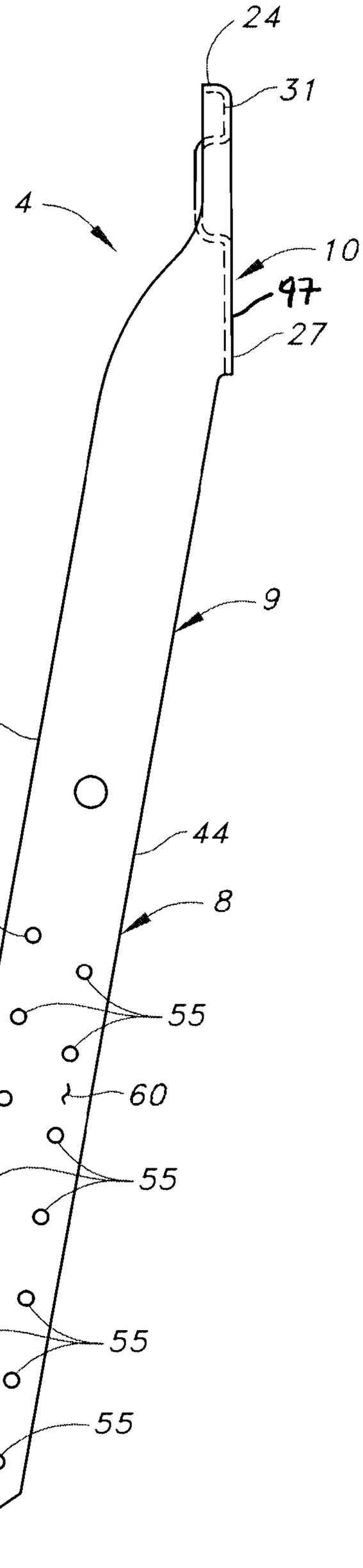
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FIG._48

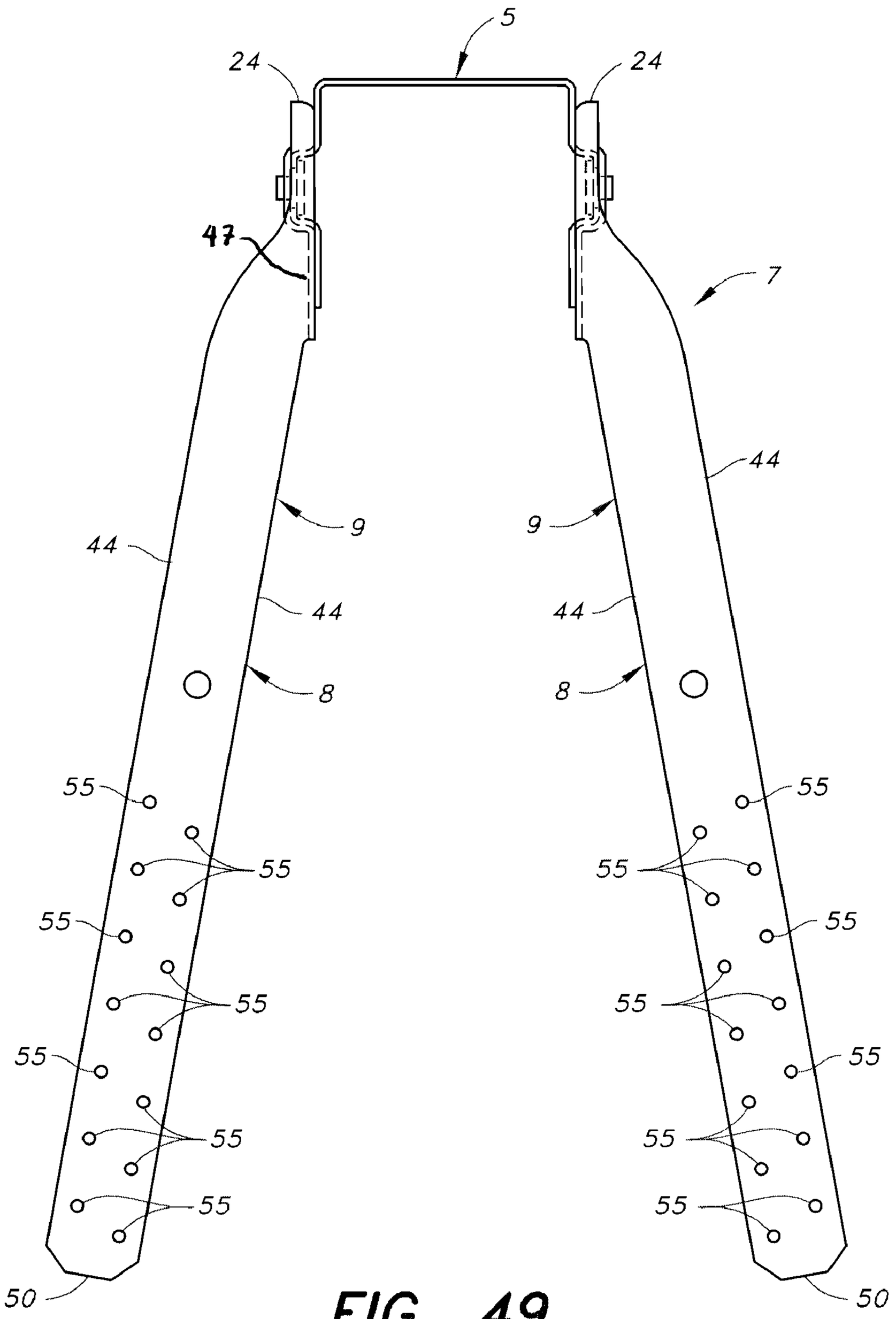
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FIG._49

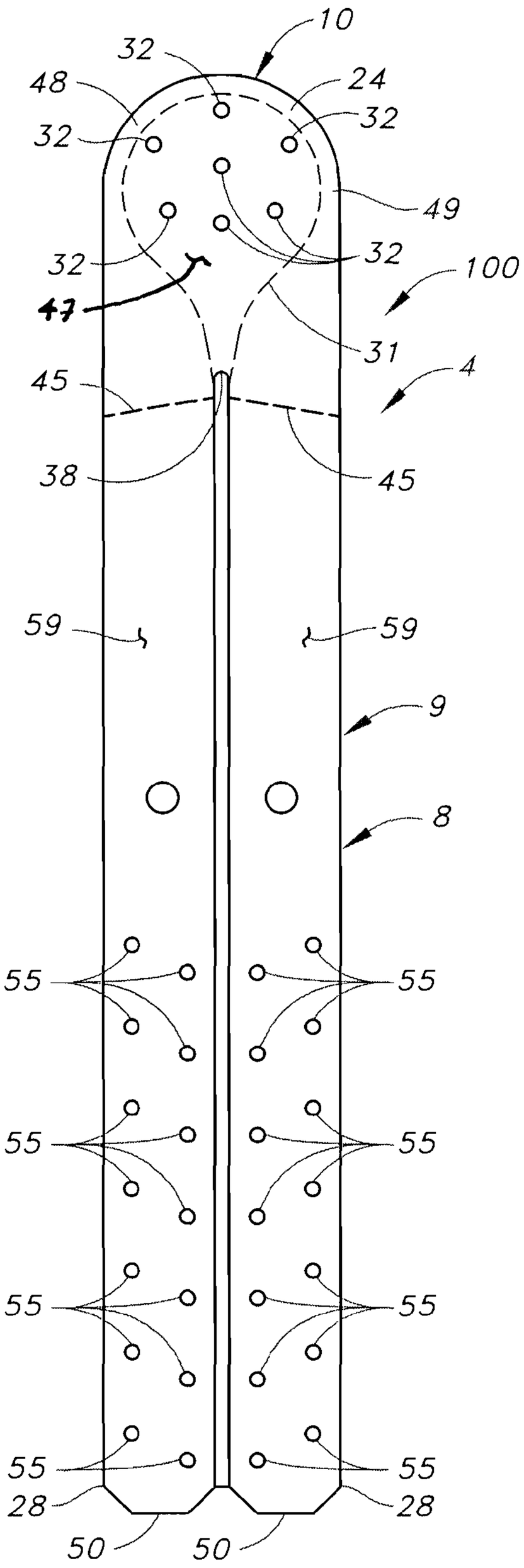
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FIG._50

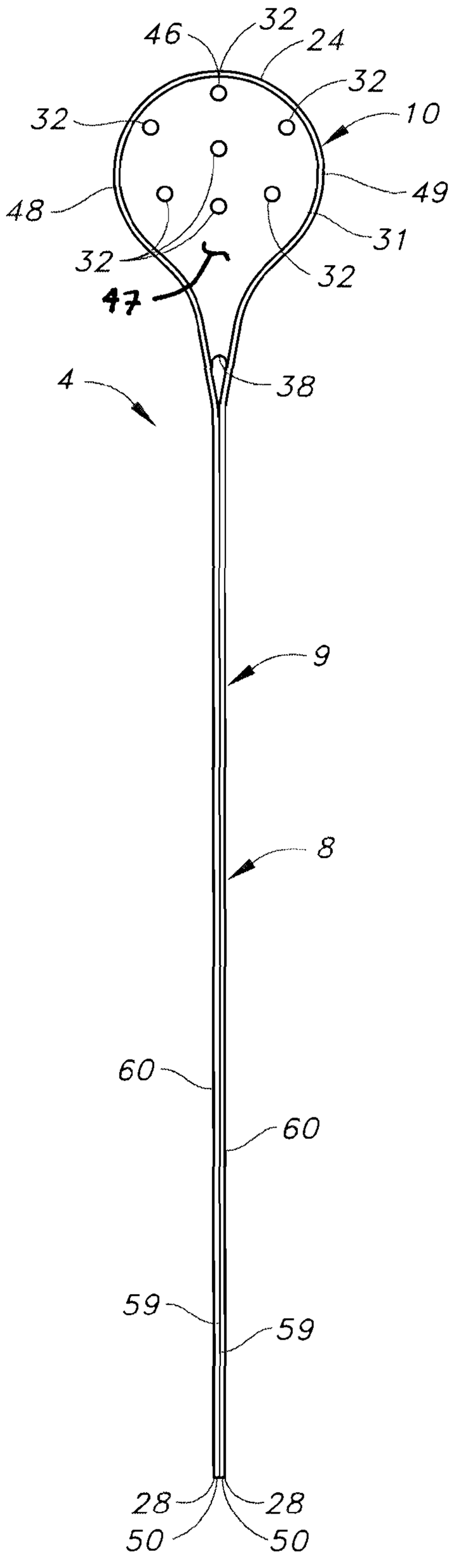
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FIG._51

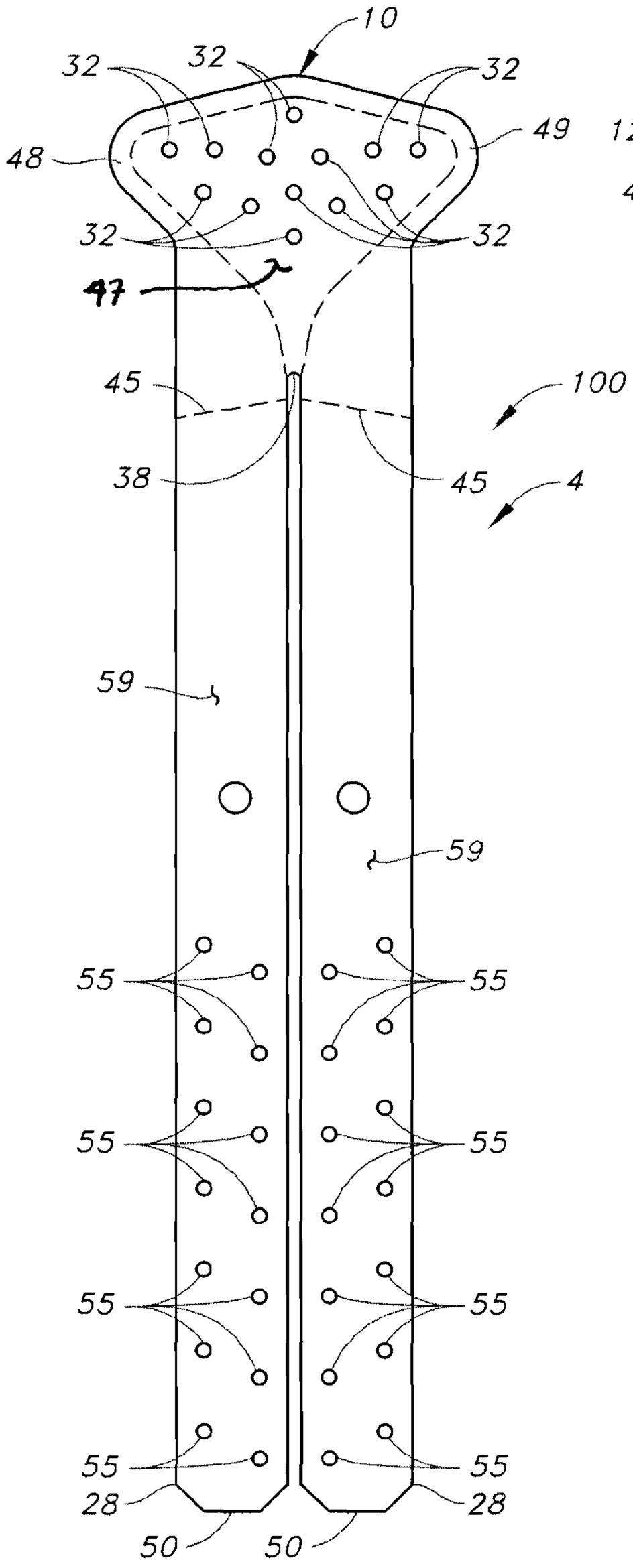
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FIG._52

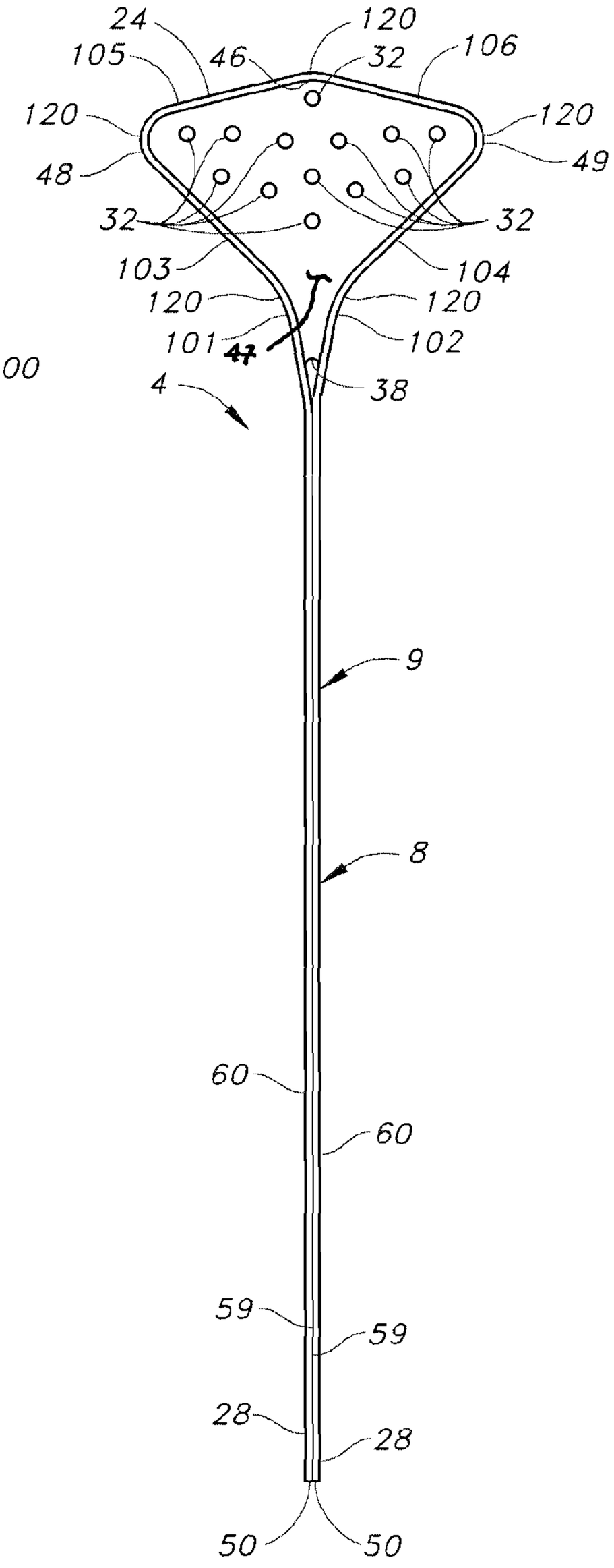
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FIG._53

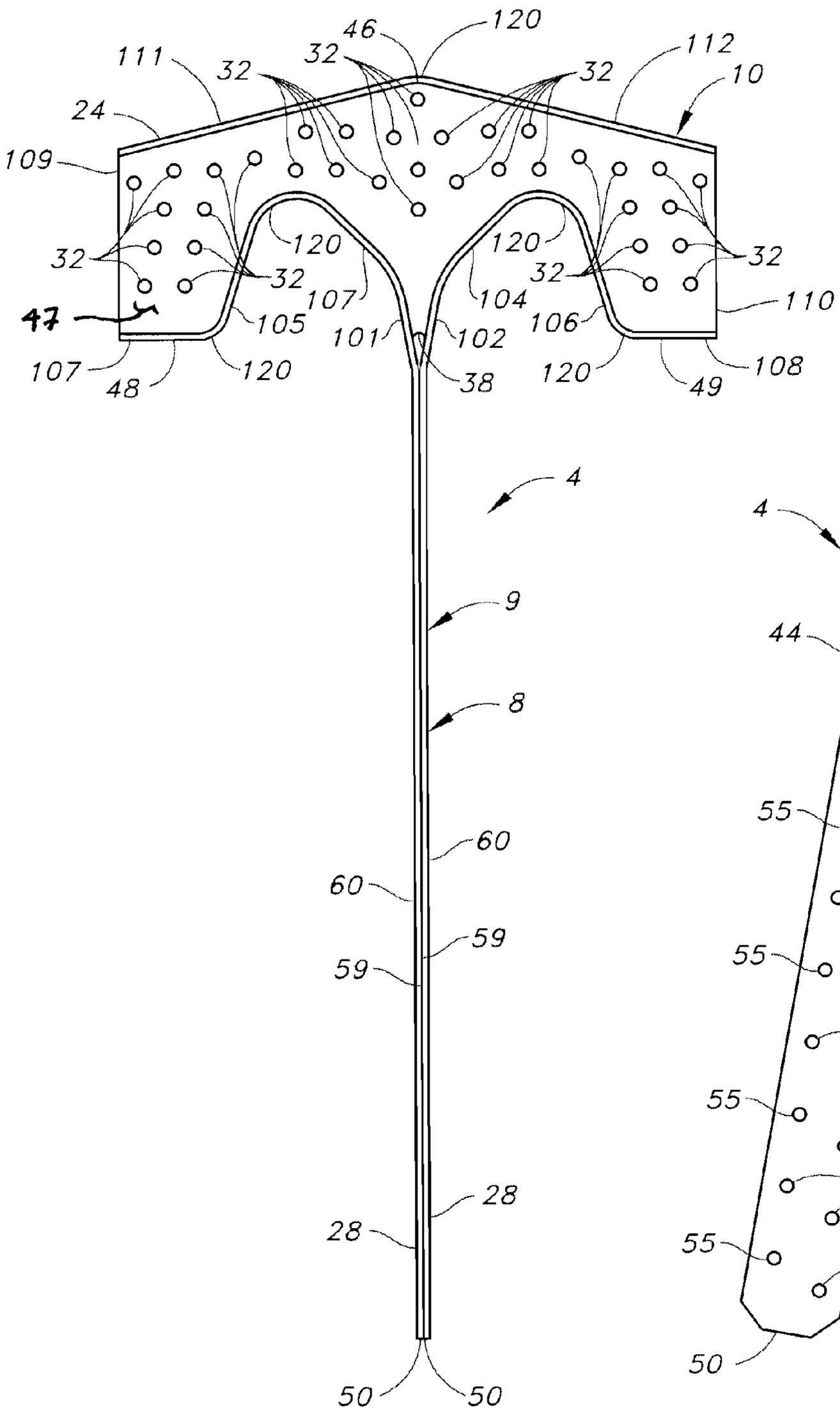
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FIG._54

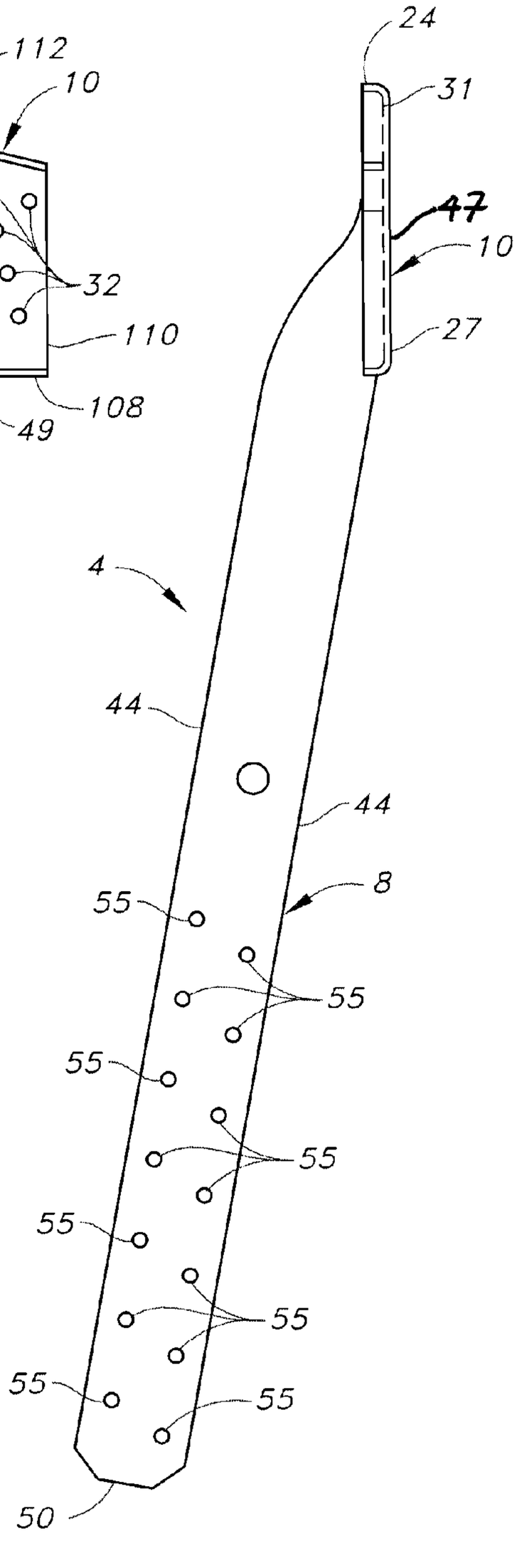
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FIG._55

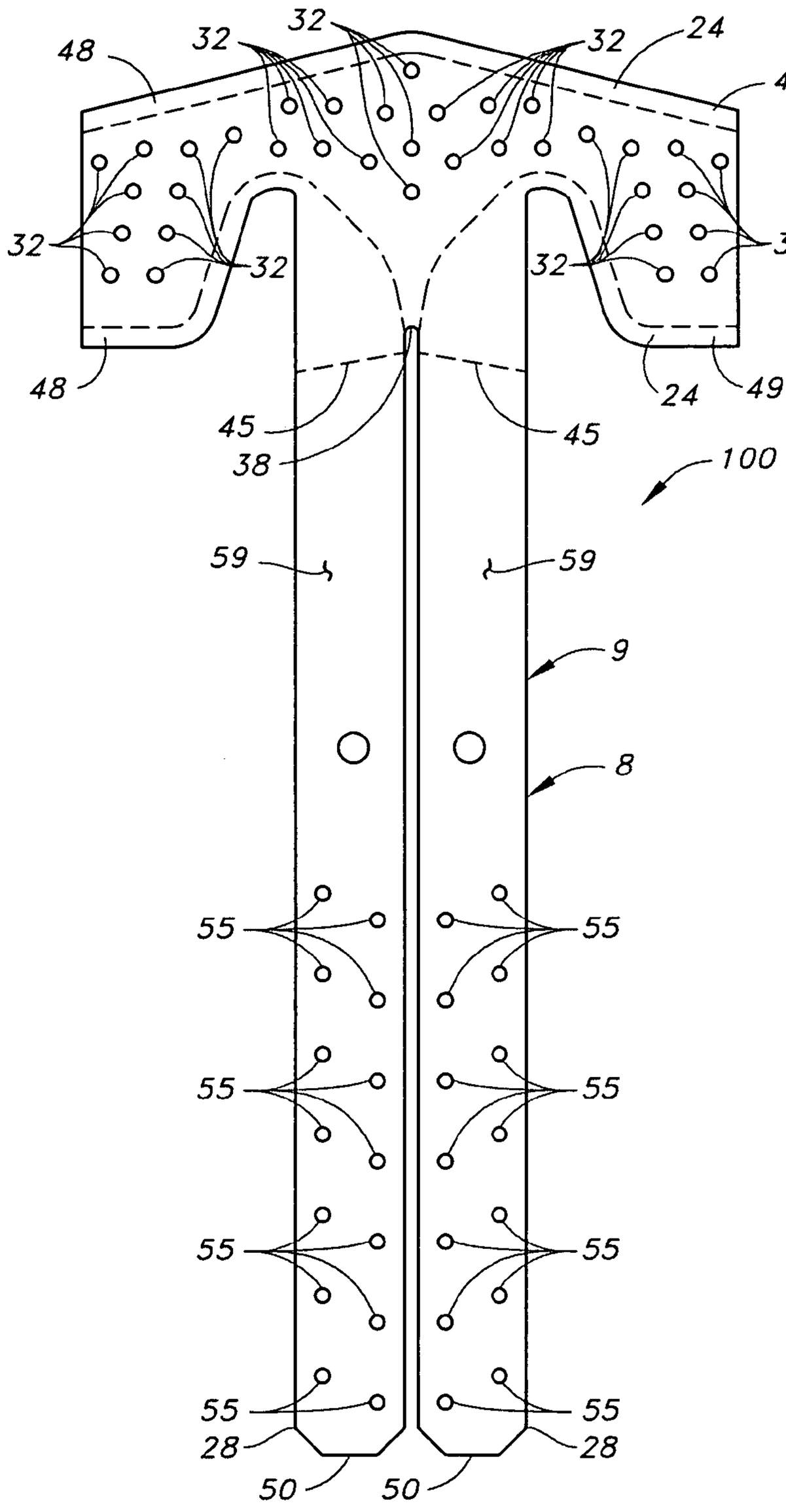
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FIG._56

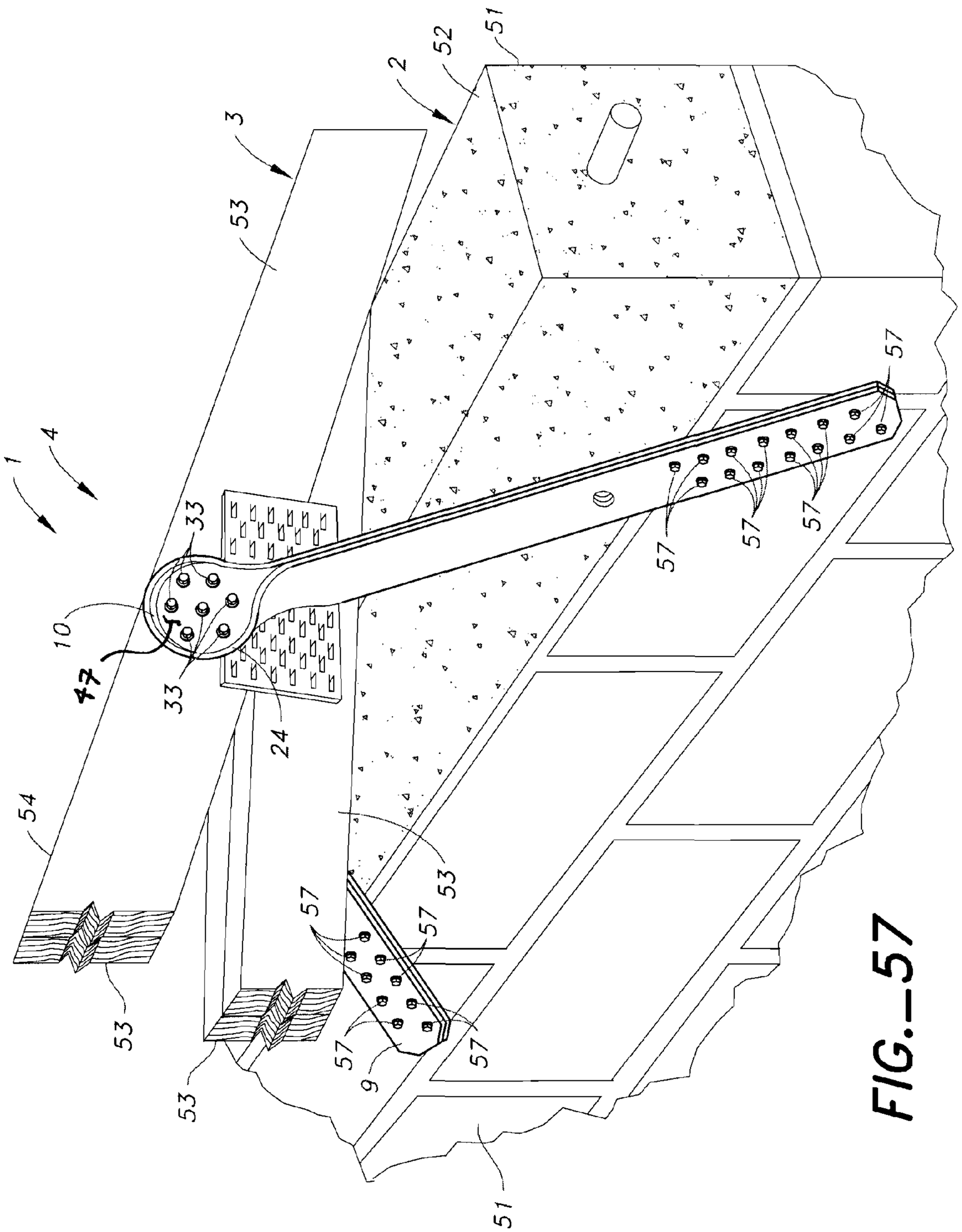

FIG._57

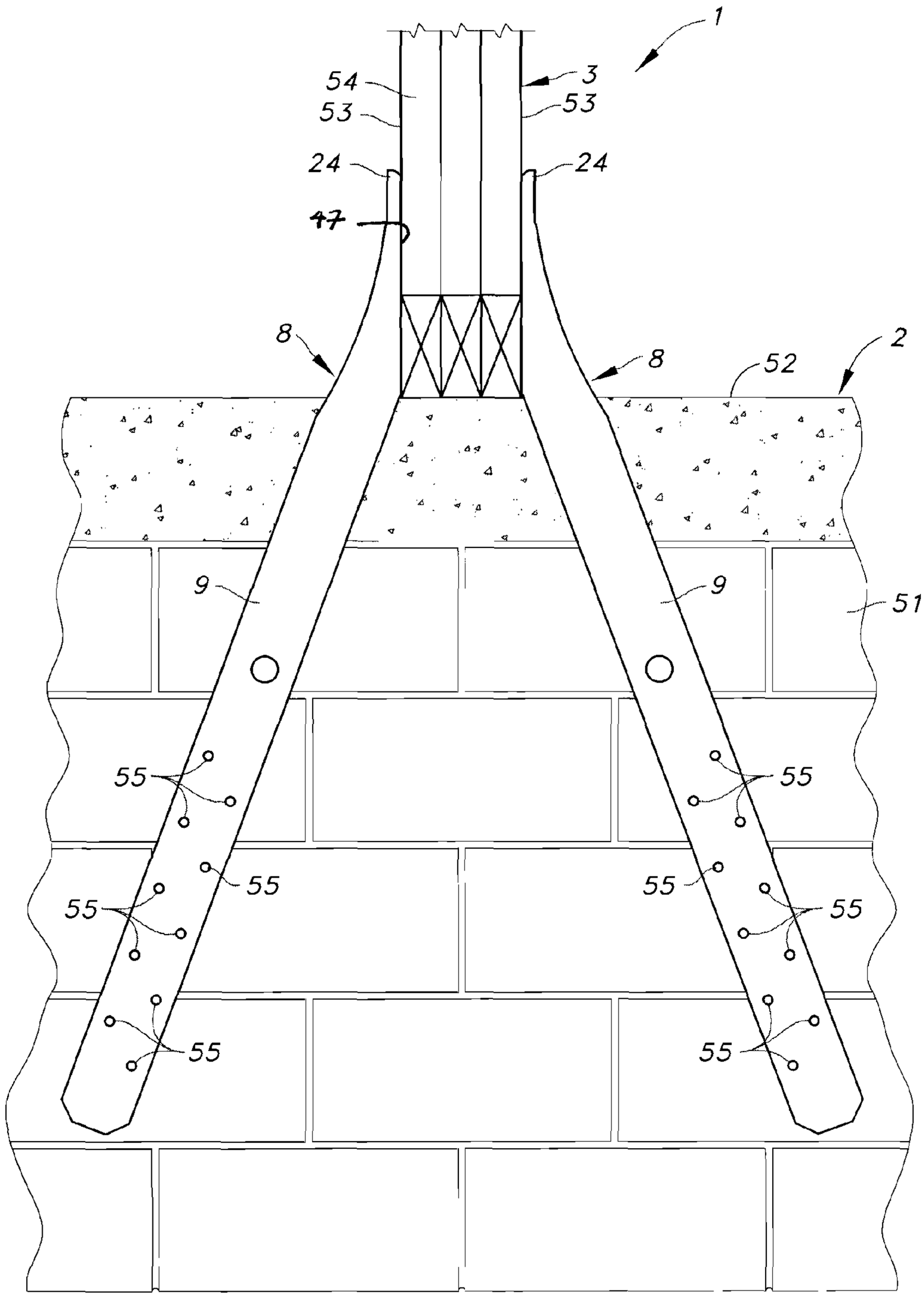

FIG._58

GIRDER TIEDOWN

The present application is a continuation-in-part of Ser. No. 10/912,260, filed Aug. 4, 2004.

BACKGROUND OF THE INVENTION

The roof members of building structures, particularly those located in high wind areas, are often tied down to the supporting wall system to resist the uplift forces caused by winds blowing into, over, and around the structure. Conventionally, these members are tied down to the walls with simple light gauge steel brackets and/or straps which attach to the sides and tops of the roof members and the wall system. The connectors are fastened to the roof and wood wall members with nails or wood screws. The connectors are fastened to concrete or masonry walls with masonry screws, epoxied rods, or are simply embedded into the substrate during construction of the walls. Often the roof is configured such that multiple roof members are supported on one end by the wall and on the other end by a single roof member, commonly referred to as a girder. Each of the roof members which are supported by the girder carry both uplift and download forces which are transferred into the girder through mechanical connections. Often the accumulated forces transferred into the girder can be significant, so much that conventional light gauge connectors do not adequately resist the high uplift forces in the member and as such heavy duty connectors are required to be attached to these girders. Attachment of these heavy duty connectors can be challenging in areas of the country which use concrete or masonry walls because many products are installed to the top of the wall system. This poses problems particularly when products are installed after the framing is complete, which is a common occurrence. Finally, it is standard engineering practice that these high uplift forces are resisted through connector attachment to the top chord of a truss member by either fastening directly to the member or wrapping over the top of the member. Top chord pitches vary widely from job to job and can even vary on the same job in different areas of the roof. The present invention provides a significant improvement on these prior art connectors by offering a connector which can be field adjusted to meet the variable roof pitches and can attach to the face of the wall by means of masonry anchors driven into the constructed wall. The invention can be attached to the top chord through high capacity screws or the traditional method of wrapping over the truss. The present invention also provides an adjustable connector that does not have to be embedded in concrete or masonry and that has unusually strong pin connections that make it adjustable.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an adjustable connector for connecting an elongate substantially vertical supporting structural member and an elongate generally horizontal supported structural member. This object is achieved by providing a connector with a side attachment member that attaches to an elongate substantially vertical supporting structural member and a cap that attaches to the elongate generally horizontal supported structural member, with a pin connection that enables rotation between the cap and the side attachment member.

An object of the present invention is to provide a pin connection that prevents inadvertent separation of the cap and the side attachment member. This object is achieved by providing a pin connection with a pin opening in either the cap or the first side attachment member, or both, and a pin that passes through the pin opening or openings, the pin having one or more restraint extensions that extend beyond the circumference of the pin opening or openings, preventing the pin from withdrawing from the pin opening or openings. In some embodiments, this is achieved by forming the restraint extensions with one or more lobes that extend beyond the body of the pin and the pin opening.

The pin is able to rotate within the pin opening or openings. If the pin is fixed to either the cap or side attachment member, the pin opening is in the other of the cap or side attachment member. The pin opening is not sealed. By contrast, a preferred method of attaching the pin is to insert its first end in a D-shaped aperture in either the cap or side attachment member. The first end of the pin is formed with a D-shaped circumference and it is welded in place in the D-shaped aperture so that it cannot rotate within the D-shaped aperture or withdraw from it, and the D-shaped aperture is sealed so that there is no visible opening.

An object of the present invention is to provide a strong pin connection. In some embodiments, this is achieved by fixedly attaching the pin to either the cap or the side attachment member. In some embodiments, this is further achieved by welding the first end of the pin to the cap. In other possible embodiments, the pin can be fixedly attached to the side attachment member. In some embodiments, the pin is not fixed to either the cap or the side attachment member, but instead passes through pin openings in both and has restraint extensions at both ends. In some embodiments, these are formed as circumferential flanges. In some embodiments, this is simply achieved by using a rivet as the pin.

An object of the present invention is to provide a pin connection that allows the cap and side attachment member to be separated. In some embodiments, this is achieved by forming the pin opening with open lobes that match the lobes on the pin, like a keyhole and key combination.

An object of the present invention is to provide a connector that resists uplift. In some embodiments, this is achieved by forming the cap with a substantially planar top attachment portion that interfaces with the supported structural member.

An object of the present invention is to provide a connector that attaches to both sides of the supported structural member. In some embodiments, this is achieved by forming the cap with a second substantially planar side attachment portion.

An object of the present invention is to provide a connector that attaches to both side of the supporting structural member. In some embodiments, this is achieved by having a second side attachment member and a second pin connection. If the cap has no substantially planar top attachment portion, a connector that has a second side attachment member and a cap with a second substantially planar side attachment portion, is the same as two connectors that each have only a first side attachment member and a cap with only a first substantially planar side attachment portion.

An object of the present invention is to provide a connector that provides rotation on an axis parallel to the supporting structural member. In some embodiments, this is achieved by forming the side attachment member with a connection portion that is attached to the edge of the substantially planar attachment portion. In some embodiments, this is further achieved by welding the connection portion to the substantially planar attachment portion.

An object of the present invention is to provide a secure connection between the connector and the supporting structural member. This is achieved by forming the side attachment member with fastener openings and passing fasteners through the openings and into the supporting structural member.

An object of the present invention is to provide a secure connection between the connector and the supporting structural members. This is achieved by forming the side attachment member with fastener opening and passing fasteners through the openings and into the supporting structural member. If the supporting structural member is made of masonry or concrete, the preferred fasteners connecting the side attachment member with are masonry anchors.

An object of the present invention is to provide a secure connection between the connector and the supported structural members. This is achieved by forming the cap with fastener opening and passing fasteners through the openings and into the supported structural member. If the cap is formed with a with a substantially planar top attachment portion and a second substantially planar side attachment portion, the preferred fasteners connecting the cap to the supported structural member are nails. If the cap is formed without a substantially planar top-attachment portion, the preferred fasteners connecting the cap to the supported structural member are self-drilling wood screws.

An object of the present invention is to provide a connector that is corrosion resistant. This is achieved by forming the connector from galvanized steel and, when the connector includes welding, painting the connector.

An object of the present invention is to provide a connector that has reinforced pin openings. In some embodiments, this is achieved by creating circumferential embossments around the pin openings. A further object of the present invention is to provide pin openings that share the transfer of loads between the cap and the side attachment members with the pin. In some embodiments, this is achieved by forming the cap and side attachment members with matching embossments that fit together with matched bearing surfaces.

An object of the present invention is to provide a connector that has side attachment members that are reinforced against bending. In some embodiments, this is achieved by forming the substantially planar attachment portions with reinforcing flanges. In some embodiments, this is achieved by forming the connection portions with reinforcing flanges.

An object of the present invention is to provide a connector that has side attachment members that are simple, strong and lightweight. In some embodiments, this is achieved by forming the side attachment member by bending a V-shaped length of steel in half to form a two-ply substantially planar attachment portion and a connection portion that joins the plies at the point where the two legs of the V join.

There are two basic preferred types of the present invention. The first is formed from heavier gauge steel, includes welding, and is painted, which is a matter of course when the connector includes welded parts, since welding destroys the corrosion protection offered by galvanized steel. Preferably, the heavier gauge steel type of the present invention uses a pin that is welded to one component of the connector. The second basic type of the present invention is formed from lighter gauge steel, is not welded, and is therefore not painted either. The lighter gauge steel type preferably uses a pin component that is separate from the components that connect to the supporting structural member and the supported structural member. The light gauge steel type preferably includes features, such as additional flanges and embossments, that stiffen it and thereby provide strength similar to that of the heavier gauge steel.

Both basic preferred types of the present invention have a cap that connects to or holds the supported structural member, and two side attachment members, or straps, that are connected to the cap by pin connections and which, in turn, connect to the supporting structural member.

In the first basic preferred form of the present invention, the pin is a post that is connected to, or part of, either the cap or side attachment member. There is a matching pin opening in the opposed cap or side attachment member, through which the post passes, forming a hinge. The preferred form of this pin connection permits the cap and side members to be separated from each other.

In the second basic preferred form of the present invention, the pin is separate from the cap and side attachment members, both of which have pin openings, so that the pin passes through both the cap and the side attachment member. The ends of the pin are widened and the cap and side attachment members can not be separated.

Another object of the present invention is to provide an unadjustable girder tiedown that can be made easily and at low cost on automated machinery without welding or painting and that can be directly attached to the supporting and supported structural members without the use of a cap.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and ends at the outer side of the wall, and a two-sided form of the connector of the present invention that has fixed pins.

FIG. **1**B is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and which overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has fixed pins.

FIG. **1**C is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a flat girder truss that is orthogonal to the wall and ends at the outer side of the wall, and a two-sided form of the connector of the present invention that has fixed pins.

FIG. **1**D is a perspective view of a wood frame wall, with a double top plate surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and which overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has fixed pins.

FIG. **2** is a side elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is welded to the edge of the substantially planar attachment portion.

FIG. **3** is a front elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is welded to the edge of the substantially planar attachment portion.

FIG. **4** is another side elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is welded to the edge of the substantially planar attachment portion.

FIG. **5** is an end elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is welded to the edge of the substantially planar attachment portion.

FIG. **6** is a top plan view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and two fixed pins with restraint extensions in the form of twin lobes.

FIG. **7** is a side elevation view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and two fixed pins with restraint extensions in the form of twin lobes.

FIG. **8** is a front elevation view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and two fixed pins with restraint extensions in the form of twin lobes.

FIG. **9** is a bottom plan view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and two fixed pins with restraint extensions in the form of twin lobes.

FIG. **10** is an elevation view of the outer side of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall, and a two-sided form of the connector of the present invention that has fixed pins and a cap that has two substantially planar side attachment members joined by a substantially planar top attachment portion.

FIG. **11** is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and which overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has fixed pins and a split cap that has two substantially planar side attachment portions but no substantially planar top attachment portion connecting the two.

FIG. **12** is a top plan view of an embodiment of the cap of the connector of the present invention in which the cap has one substantially planar side attachment member and a fixed pin with a restraint extension in the form of twin lobes.

FIG. **13** is a side elevation view of an embodiment of the cap of the connector of the present invention in which the cap has one substantially planar side attachment member and a fixed pin with a restraint extension in the form of twin lobes.

FIG. **14** is a front elevation view of an embodiment of the cap of the connector of the present invention in which the cap has one substantially planar side attachment member and a fixed pin with a restraint extension in the form of twin lobes.

FIG. **15** is a top plan view of an embodiment of the cap of the connector of the present invention in which the cap has two separate substantially planar side attachment members and two fixed pins with restraint extensions in the form of twin lobes.

FIG. **16** is an elevation view of the outer side of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall, and a two-sided form of the connector of the present invention that has fixed pins and a cap that has two separate substantially planar side attachment members.

FIG. **17** is a top plan view of the connection of the present invention in which the supported structural member is not orthogonal to the supporting structural member, meeting the wall at an angle, and the two are connected by a connector with a cap that has two separate substantially planar side attachment members.

FIG. **18** is a top plan view of the connection of the present invention in which the supported structural member is not orthogonal to the supporting structural member, bisecting the corner of a wall, and the two are connected by a connector with a cap that has two separate substantially planar side attachment members.

FIG. **19** is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to and at the end of the wall and overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has one side attachment member with a substantially planar attachment portion and a connection portion in the same plane and a fixed pin.

FIG. **20** is an elevation view of an embodiment of the side attachment member with a substantially planar attachment portion and a connection portion in the same plane and a fixed pin.

FIG. **21** is an elevation view of an embodiment of the side attachment member with a substantially planar attachment portion and a connection portion in the same plane and a fixed pin.

FIG. **22** is a top plan view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to and at the end of the wall and overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has one side attachment member with a substantially planar attachment portion and a connection portion in the same plane and a fixed pin.

FIG. **23** is an elevation view of the outer side of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to and at the end of the wall and overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has one side attachment member with a substantially planar attachment portion and a connection portion in the same plane and a fixed pin.

FIG. **24** is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and which overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has fixed pins and a split cap that has two substantially planar side attachment portions but no substantially planar top attachment portion connecting the two. FIG. **24** is identical to FIG. **11** except that FIG. **24** shows a side attachment member in which the connection portion and substantially planar attachment portion are formed, rather than welded, together, as shown in FIG. **8**.

FIG. **25** is a side elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is orthogonally joined to the edge of the substantially planar attachment portion.

FIG. **26** is a front elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is orthogonally joined to the edge of the substantially planar attachment portion.

FIG. **27** is an end elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion is orthogonally joined to the edge of the substantially planar attachment portion.

FIG. **28** is a top plan view of the connection of the present invention with a cap that has two separate substantially planar side attachment members and two fixed pins with restraint extensions in the form of twin lobes and two side attachment members of the connector of the present invention in which the connection portion is orthogonally joined to the edge of the substantially planar attachment portion.

FIG. **29** is a side elevation view of a first side attachment member that is formed by bending a V-shaped strap to form a two-ply substantially planar attachment portion and a connection portion, with a reinforcing embossment around the pin opening, from the middle of the V-shaped strap.

FIG. **30** is a side elevation view of an embodiment of the cap of the connector of the present invention in which the cap

has two substantially planar side attachment members joined by a substantially planar top attachment portion and showing the fixed pin in detail.

FIG. **31** is a front elevation view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and showing the fixed pin in detail. FIG. **31** is identical to FIG. **8** but is represented for convenience in viewing different angles of the pin connection in the cap.

FIG. **32** is a cross-sectional view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and showing the fixed pin in detail.

FIG. **33** is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and overhangs the outer side of the wall, and a two-sided form of the connector of the present invention that has first side attachment members that are formed by bending a V-shaped strap to form two-ply substantially planar attachment portions and connection portions, with reinforcing embossments around the pin openings, from the middle of the V-shaped strap.

FIG. **34** is a front elevation view of a first side attachment member that is formed by bending a V-shaped strap to form a two-ply substantially planar attachment portion and a connection portion, with a reinforcing embossment around the pin opening, from the middle of the V-shaped strap.

FIG. **35** is a front elevation view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and two pin openings.

FIG. **36** is a side elevation view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and two pin openings.

FIG. **37** is a bottom plan view of an embodiment of the cap of the connector of the present invention in which the cap has two substantially planar side attachment members joined by a substantially planar top attachment portion and pin openings.

FIG. **38**A an elevation view of the outer side of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall, and a two-sided form of the connector of the present invention that has first side attachment members that are formed by bending a V-shaped strap to form two-ply substantially planar attachment portions and connection portions, with reinforcing embossments around the pin openings, from the middle of the V-shaped strap.

FIG. **38**B is an end view of an embodiment of the pin connection showing matching embossments in the cap and side attachment member and a reinforcing flange in the side attachment member.

FIG. **39** is a front elevation view of a first side attachment member that is formed with reinforcing flanges and a reinforcing embossment around the pin opening.

FIG. **40** is a side elevation view of a first side attachment member that is formed with reinforcing flanges and a reinforcing embossment around the pin opening.

FIG. **41** is an end elevation view of an embodiment of the side attachment member of the connector of the present invention in which the connection portion and the substantially planar attachment portion are both formed with reinforcing flanges and the connection portion is formed with a reinforcing embossment around the pin opening.

FIG. **42** is a side elevation view of an embodiment of the fixed pin of the present invention.

FIG. **43** is an opposite side elevation view of an embodiment of the fixed pin of the present invention.

FIG. **44** is a top plan view of an embodiment of the fixed pin of the present invention, showing the D-shape of the first end of the pin in dotted line, but not showing all three diameters of the preferred embodiment because they are too close to be shown fully separated.

FIG. **45** is a bottom plan view of an embodiment of the fixed pin of the present invention, showing the D-shape of the first end of the pin, but not showing all three diameters of the preferred embodiment because they are too close to be shown fully separated.

FIG. **46** is a side elevation view of the an embodiment of the cap of the connector of the present invention showing the D-shaped fixture opening before the pin is inserted and fixed.

FIG. **47** is a side elevation view of a first side attachment member that is formed by bending a V-shaped strap to form a two-ply substantially planar attachment portion and a connection portion, with a reinforcing embossment around the pin opening, from the middle of the V-shaped strap.

FIG. **48** is a front elevation view of a first side attachment member that is formed by bending a V-shaped strap to form a two-ply substantially planar attachment portion and a connection portion, with a reinforcing embossment around the pin opening, from the middle of the V-shaped strap.

FIG. **49** is a front elevation view of two side attachment members formed by bending a V-shaped strap connected by a cap member to which they are attached by pins.

FIG. **50** is a top plan view of a V-shaped blank from which an unadjustable embodiment of a side attachment member with a teardrop-shaped connection portion is formed.

FIG. **51** is a side elevation view of an unadjustable embodiment of a side attachment member with a teardrop-shaped connection portion.

FIG. **52** is a top plan view of a V-shaped blank from which an unadjustable embodiment of a side attachment member with a connection portion in the general shape of an irregular quadrilateral is formed.

FIG. **53** is a side elevation view of an unadjustable embodiment of a side attachment member with a connection portion in the general shape of an irregular quadrilateral.

FIG. **54** is a top plan view of an unadjustable embodiment of a side attachment member with a connection portion that is generally M-shaped.

FIG. **55** is a side elevation view of an unadjustable embodiment of a side attachment member with a connection portion that is generally M-shaped.

FIG. **56** is a top plan view of a V-shaped blank from which an unadjustable embodiment of a side attachment member with a connection portion that is generally M-shaped is formed.

FIG. **57** is a perspective view of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall and ends at the outer side of the wall, and a two-sided form of the connection of the present invention that is unadjustable and has teardrop-shaped connection portions.

FIG. **58** is an elevation view of the outer side of a concrete masonry wall, with a concrete tie beam surmounting the wall, supporting a pitched girder truss that is orthogonal to the wall,

and a two-sided form of the connection of the present invention that is unadjustable and has teardrop-shaped connection portions.

DETAILED DESCRIPTION OF THE INVENTION

Basic Connection

As shown in FIGS. **1**A-**1**D, the present invention is a connection **1** that comprises an elongate substantially vertical supporting structural member **2**, further comprising two sides **51** and a top **52**, supporting an elongate generally horizontal supported structural member **3**, further comprising two sides **53** and a top **54**, that is not parallel to the elongate substantially vertical supporting member **2**, and a connector **4**. In most installations, the supported structural member **3** and the supporting structural member **2** will be generally orthogonal, but as shown in FIG. **17** the supported structural member **3** may be diagonal to the supporting structural member **2**. In particular, as shown in FIG. **18**, trusses, the preferred form of the supported structural member **3**, installed at corners run at 45 degrees to the supporting structural member **2**, bisecting what is usually a 90 degree angle between two walls, the preferred form of the supporting structural member **2**.

The elongate substantially vertical supporting structural member **2** is preferably a building wall **2**, typically an exterior wall **2**, possibly framed in wood, as shown in FIG. **1**D, or steel, but typically a masonry wall **2**, as shown in FIGS. **1**A-**1**C, **10**, **11**, **15**-**19**, **22**-**24**, **28**, **33** and **38**A. In particular, the masonry wall **2** is illustrated as concrete block surmounted by a poured concrete tie beam. In all of Florida except the northernmost part, it is common to see structures built with concrete block masonry exterior walls **2**. Concrete block is used because it has some inherent wind-resistance benefits, and because it resists termite infestation. It develops a good load path to resist uplift forces caused by wind, it is heavier than wood framing, a reinforced concrete block wall system creates fewer connection points than wood framing, which may imply fewer construction errors, and concrete block offers impact resistance to windborne debris. Concrete block exterior walls **2** are not composed solely of concrete block; instead, the concrete blocks usually sit within a grid of poured concrete and rebar. A key structural element of an exterior concrete block wall is usually the tie beams. The tie beam is located at the top **54** of the wall **2** and is either poured concrete or masonry bond beams (U-shaped concrete blocks filled with concrete). Poured concrete naturally creates a level tie beam, but it is only common in the southernmost part of Florida. In the prior art, hurricane straps that held down the roof trusses were placed in the still-wet concrete; if mislocated, they could be replaced by hurricane straps retrofitted to the tie beam with masonry anchors.

The elongate generally horizontal supported structural member **3** is preferably a roof member, such as a beam, girder, truss, girder truss or rafter **3**. The particular connection that is shown in shown in FIGS. **1**A-**1**D, **10**, **11**, **15**-**19**, **22**-**24**, **28**, **33** and **38**A is between a girder truss **3** and a wall **2**. A girder truss **3** is a heavy truss from which other, lighter trusses may be suspended. Girder trusses **3** require stronger tie down connectors **4** because they generate high uplift forces, particularly in high wind areas and particularly when they overhang the outside of the wall **2**. The greater the overhang, the more uplift is caused by wind loading. Larger overhangs are, however, particularly desirable in areas with a lot of rain, which are also typically areas with high winds.

The connector **4** of the present invention improves on the prior art by providing an exceptionally strong connection **1** between trusses **3** and walls **2** that need not be cast in concrete, is suitable for both original and retrofit installations, and is adjustable to accommodate trusses **3** of various pitches. At its most basic, the connector **4** comprises a cap **5**, connected to said supported structural member **3**, a first side attachment member **8** and a pin connection **11** between the cap **5** and the first side attachment member **8**. The cap **5** comprises a first substantially planar side attachment portion **6** that interfaces with the supported structural member **3**. The first side attachment member **8** comprises a substantially planar attachment portion **9** that interfaces with and is fastened to the supporting structural member **2**, and a connection portion **10** that is positioned alongside the first substantially planar side attachment portion **6** of the cap **5**. The first pin connection **11** enables rotation between the cap **5** and the first side attachment member **8**, and that connects said cap **5** to said first attachment member **8**, so that the cap **5** can be attached to supported structural members **8** of various pitches.

There are several primary variations on the basic form of the connector **4** of the present invention. The connector **4** can be either one-sided or two-sided, having either only a first side attachment member **8** when it is one-sided or a first side attachment member **8** and a second side attachment member **26** when it is two-sided. The cap **5** can take several different basic forms. The pin connections **11** can either have pin **13** that is fixed to either the cap **5** or the one of the first and second side attachment members **8** and **26**, or a pin **13** that is separate from the cap **5** and the first and second side attachment members **8** and **26**. If the pin **13** is fixed, it passes through one pin opening **12** in the cap **5** or the one of the first and second side attachment members **8** and **26**. If the pin **13** is separate, it passes through two matching pin openings **12** in the cap **5** and one of the first and second side attachment members **8** and **26**. If the connector **4** is one-sided, it will preferably have one side attachment member **8** positioned to one side of the supported structural member **3**. If the connector **4** is two-sided it will preferably have two side attachment members **8** and **26**, one on each side of the supported structural member **3**. The cap **5** can take three basic forms. First, an inverted U-shaped, with two substantially planar side attachment portions **6** and **22** that interface with the sides **53** of the supported structural member **3** and a substantially planar top attachment portion **21** that connects the two substantially planar side attachment portions **6** and **22**. Second, an inverted L-shape (if the connection is one-sided) or a pair of inverted L-shapes (if the connection is two-sided), the L-shape having a substantially planar side attachment portion **6** or **22** and a substantially planar top attachment portion **21**. Third, one (if the connection is one-sided) or two (if the connection is two-sided) substantially planar side attachment portions **6** and **22**. All three basic forms of the cap **5** can be fastened to the supported structural member **3** using fasteners **55** such as nails, screws or bolts. The cap **5** could also be bonded to the supported structural member **3** using adhesives or welds, depending on the materials used to compose the cap **5** and the supported structural member **3**. Preferably, the connector **4** will be made from steel and the supported structural member **3** will be made primarily of wood, but the connector **4** might also be made of other metals, plastics or composites, and the same is true of the supported structural member **3**. When fasteners **55** are used to fasten the cap **5** to the supported structural member **3**, the fasteners **55** can pass through the substantially planar side attachment portion or portions **6** and the substantially planar top attachment portion or portions **21**. Because the connector **4** is designed primarily to resist uplift forces, fasteners **55** or other bonding is only critical when the cap **5** has no substantially planar top attachment portion **21**. In the

preferred embodiment of this form, fasteners **55** pass through the substantially planar side attachment portion or portions **6** into the side or sides **53** of the supported structural member **3**.

As shown in FIGS. **2**, **4**, **20**, **25** and **40**, preferably the first pin connection **11** further comprises a first pin opening **12** in one of the cap **5** and the first side attachment member **8**, and a first pin **13** that passes through the first pin opening **12**. As shown in FIGS. **42-45**, the first pin **13** preferably comprises a body **14** that has a circumference **15**, a first end **16**, and a second end **17** with a first restraint extension **18** that extends beyond the circumference **15** of the body **14**. As shown in FIGS. **2**, **4**, **20**, **25**, **29** and **40**, the first pin opening **12** has a circumference **19**. The first restraint extension **18** extends beyond the circumference of the first pin opening **12**, preventing the first pin **13** from withdrawing from the first pin opening **12**.

First Preferred Embodiment

In the first preferred embodiment, the first pin **13** is fixedly attached to the other of the cap **5** and the first side attachment member **8** that does not have a first pin opening **12**. Preferably, as shown in FIG. **1**A, the first pin **13** is fixedly attached to the cap **5** and the first pin opening **12** is in the first side attachment member **8**.

Preferably, the first restraint extension **18** is one or more lobes **18** that extend beyond the circumference **15** of the body **14** and the circumference **19** of the first pin opening **12**. Preferably, the first pin opening **12** has one or more open lobes **20** that extend beyond the circumference **19** of the first pin opening **12**. Preferably, the fixedly attached first pin **13** is inserted through the first pin opening **12** in an orientation that permits the one or more lobes **18** on the first pin **13** to pass through the one or more open lobes **20** of the first pin opening **12**, and the cap **5** and the first side attachment member **8** are then rotated on the first pin connection **11** so that the one or more lobes **18** on the first pin **13** no longer match the one or more open lobes **20** of the first pin opening **12**, thereby restraining the cap **5** and the first side attachment member **8** from being separated at the first pin connection **11**. The open lobes **20** permit the first side attachment member **8** and the cap **5** to be separated and reconnected. The open lobes **20** are preferably oriented so that they will be 90 degrees off of the lobes **18** when the supported structural member **3** is perfectly horizontal and the supporting structural member **2** is perfectly vertical, so that an interlock is formed in every orientation except if the supported structural member **3** is perfectly vertical, which is essentially impossible when the supported structural member **3** is a truss or other similar roofing member. Preferably, the pins **13** are machined from 1¾" diameter hot rolled bar stock with CNC (computer numerical control) lathes and machining centers. Preferably, the pins **13** each have two opposed lobes **18** that are ⅞" wide and extend to the 1¾" diameter of the bar stock. Preferably, the thickness of the lobes **18** is approximately one third the length of the pins **13**. The middle third of the pin **13** is preferably 1.312" in diameter while the remaining third is preferably 1.245" in diameter with a flat portion of the circumference making it roughly D-shaped. As shown in FIGS. **30-32** and **42-46**, the pins **13** are preferably fixed to the cap **5** by being inserted in D-shaped apertures **30** in the substantially planar side attachment portions **6** and **22** until the pins are flush with the insides of the substantially planar side attachment portions **6** and **22** and then welded on the insides of the substantially planar side attachment portions **6** and **22** with fillet welds **39** that go around the circumferences of the D-shaped apertures. The D shape ensures that the pins **13** cannot rotate so that the welds **39** are not stressed by torsion.

Preferably, the cap **5** additionally comprises a substantially planar top attachment portion **21** that interfaces with the supported structural member **3**. As shown in FIGS. **11-19**, **22-24** and **28**, the cap **5** could be formed with a first substantially planar attachment portion **6** in the case of a one-sided variant of the connector **4**, and the cap **5** can be formed with first and second substantially planar attachment portions **6** and **22** that are not connected. However, as shown in FIGS. **1**A-**1**D, **6-10**, and **31-33**, the cap can be formed with first and second substantially planar attachment portions **6** and **22** that are connected by a substantially planar top attachment portion **21**. The width of the cap **5** varies according to the width of the supported structural member **3**, which is usually made from nominal 2×4 umber. For 2-ply, 3-ply, 4-ply and 5-ply supported structural members **3**, the width of the cap is preferably approximately 3½", 5.062", 7¼ and 8.312", respectively. With the forms of the connector **4** of the present invention in which the cap **5** has a top attachment portion **21**, the fixed pins **13** herein described can be advantageous because they allow the side attachment members **8** and **26** to be separated from the cap member **5**, making the parts somewhat interchangeable.

Preferably, the cap **5** can additionally comprise a second substantially planar side attachment portion **22** that interfaces with the supported structural member **3**. In a single-sided variant of the connector **4** of the present invention, a second side attachment portion **22** is not strictly necessary. When the cap **5** has only a first side attachment portion **6**, a plurality of fasteners **58** are necessary to resist uplift, but when the cap **5** has a top attachment portion **21**, the top attachment portion **21** can resist uplift and the fasteners **58** are less important.

Preferably, as shown in FIG. **3**, the first side attachment member **8** additionally comprises an edge **37** on said substantially planar attachment portion **9** and the connection portion **10** of the first side attachment member **8** is attached to the edge **37**. While it is possible to make a completely flat first side attachment member **8**, as shown in FIGS. **19-23**, this is normally only used at the ends of the supporting structural member **2**. As shown in FIGS. **1**A-**5**, **10**, **11** and **15**, the substantially planar attachment portion **9** and the connection portion **10** of the first side attachment member **8** are orthogonally related so that the attachment portion **9** faces a side **51** of the supporting structural member **2** and the connection portion **10** faces a side **53** of the supported structural member **3** and the cap **5**.

Preferably, as shown in FIG. **1**A, the substantially planar side attachment portion **9** of the first side attachment member **8** additionally comprises fastener openings **55**, and the connection **1** additionally comprises fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and into the supporting structural member **2**. Alternatively, the first side attachment member **8** could be made without fastener openings **55**, and could be fastened to the supporting structural member **2** either with fasteners **57** that pierce the first side attachment member **8**, an adhesive, or welds (if the supporting structural member **2** and the connector **4** are both made of metal).

Preferably, as shown in FIG. **7**, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, and the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap

5 and into the supported structural member 3. Alternatively, the cap 5 could be made without fastener openings 56, and could be fastened to the supported structural member 3 either with fasteners 58 that pierce the cap 5, an adhesive, or welds (if the supported structural member 3 and the connector 4 are both made of metal). When the cap 5 has no top attachment portion 21, the fasteners 58 are critical because uplift is transferred from the supported structural member 3 solely through the fasteners 58 to the connector 4 and the supporting structural member 2.

Preferably, the fasteners 57 that that pass through the fastener openings 55 in the first substantially planar side attachment portion 9 of the first side attachment member 8 are masonry screw anchors 57, and the fasteners 58 that pass through the fastener openings 56 in the first and second substantially planar side attachment portions 6 and 22 of the cap 5 are self-drilling wood screws 58. Most preferably, the fasteners 57 are Simpson Strong-Tie Titen HD masonry screw anchors. Most preferably, the fasteners 58 are Simpson Strong-Tie SDS Strong Drive screws.

Preferably, as shown in FIG. 32, the first end 16 of the first pin 13 is welded to the cap 5. Alternatively, the first pin 13 could be attached by a mechanical interlock, adhesive, or the like. Otherwise, the first pin 13 and the cap 5 could be cast, molded or otherwise formed as a single piece.

Preferably, as shown in FIG. 11, the connection portion 10 of the first side attachment member 8 is welded to the edge 37. Alternatively, the substantially planar side attachment portion 9 and the connection portion 10 could be attached by a mechanical interlock, adhesive, or the like. Otherwise, substantially planar side attachment portion 9 and the connection portion 10 could be cast, molded or otherwise formed as a single piece, as shown in FIG. 24. Equally, the substantially planar side attachment portion 9 and the connection portion 10 could be bent out of a single piece of metal or other material. Preferably, the connector 4 is painted. Welding destroys the corrosion protection of galvanized steel and therefore requires painting.

Second Preferred Embodiment

In the second preferred embodiment, the first pin 13 is fixedly attached to the first side attachment member 8 and the first pin opening 12 is in the cap 5. This particular arrangement, according to which the first pin 13 is fixedly attached to the first side attachment member 8, is similar to fixedly attaching the first pin 13 to the cap 5 and is, therefore, not shown in the drawings. This is less preferred than attaching the first pin 13 to the cap member 5, but it would be a functional alternative. As in the first preferred embodiment, and the first restraint extension 18 is one or more lobes 18 that extend beyond the circumference 15 of the body 14 and the circumference 19 of the first pin opening 12, and the first pin opening 12 has one or more open lobes 20 that extend beyond the circumference 19 of the first pin opening 12. The fixedly attached first pin 13 is inserted through the first pin opening 12 in an orientation that permits the one or more lobes 18 on the first pin 13 to pass through the one or more open lobes 20 of the first pin opening 12, and the cap 5 and the first side attachment member 8 are then rotated on the first pin connection 11 so that the one or more lobes 18 on the first pin 13 no longer match the one or more open lobes 20 of the first pin opening 12, thereby restraining the cap 5 and the first side attachment member 8 from being separated at the first pin connection 11. The cap 5 additionally comprises a substantially planar top attachment portion 21 that interfaces with the supported structural member 3. Preferably, the cap 5 additionally comprises a second substantially planar side attachment portion 22 that interfaces with the supported structural member 3, and the first side attachment member 8 additionally comprise an edge 37 and the connection portion 10 of the first side attachment member 8 is attached to the edge 37.

Preferably, the substantially planar side attachment portion 9 of the first side attachment member 8 additionally comprises fastener openings 55, and the connection 1 additionally comprises fasteners 57 that pass through the fastener openings 55 in the first substantially planar side attachment portion 9 of the first side attachment member 8 and into the supporting structural member 2. Preferably, the first and second substantially planar side attachment portions 6 and 22 of the cap 5 additionally comprise fastener openings 56, and the connection 1 additionally comprises fasteners 58 that pass through the fastener openings 56 in the first and second substantially planar side attachment portions 6 and 22 of the cap 5 and into the supported structural member 3. Preferably, the fasteners 57 that that pass through the fastener openings 55 in the first substantially planar side attachment portion 9 of the first side attachment member 8 are masonry screw anchors 57, and the fasteners 58 that pass through the fastener openings 56 in the first and second substantially planar side attachment portions 6 and 22 of the cap 5 are self-drilling wood screws 58.

Preferably, the first end 16 of the first pin 13 is welded to the first side attachment member 8, the connection portion 10 of the first side attachment member 8 is welded to the edge 37, and the connector 4 is painted.

Third Preferred Embodiment

The third preferred embodiment is essentially the same as the first preferred embodiment, except that it is double-sided. It is always preferable that the connection of the present invention be double-sided because a single-sided connection is weaker than its double-sided counterpart. It is shown FIGS. 1A-1D and 10. In it, the cap 5 additionally comprises a second substantially planar side attachment portion 22 that interfaces with the supported structural member 3. The connector 4 additionally comprises a second side attachment member 26 comprising a substantially planar attachment portion 9 that interfaces with and is fastened to the supporting structural member 2, and a connection portion 10 that is positioned alongside the first substantially planar attachment portion 6 of the cap 5, and a second pin connection 29 that enables rotation between the second side attachment member 26 and the cap 5.

The cap 5 further comprises a second substantially planar side attachment portion 22 that interfaces with the supported structural member 3 opposite the first substantially planar side attachment portion 6. The second pin connection 29 further comprises a second pin opening 12 in one of the cap 5 and the second attachment member 26, and a second pin 13 that passes through the second pin opening 12, the second pin 13 comprises a body 14 having a circumference 15, a first end 16, and a second end 17 with a first restraint extension 18 that extends beyond the circumference 15 of the body 14. The second pin opening 12 has a circumference 19, and the first restraint extension 18 extends beyond the circumference of the second pin opening 12, preventing the second pin 13 from withdrawing from the second pin opening 12. The second pin 13 is fixedly attached to the other of the cap 5 and the second side attachment member 26 that does not have a second pin opening 12. Preferably, the first and second side attachment members 8 and 26 are essentially the same, either identical or mirror images of each other, except in an end wall attachment as shown in FIGS. 19, 22 and 23, where it is practical to use

a side attachment member **8** or **26** that is flat or when the supported structural member **3** is not orthogonal to the supporting structural member **2**. Preferably, the pin connections **11** and **29** are essentially the same, either identical or mirror images of each other.

Preferably, the first pin **13** is fixedly attached to the cap **5** and the first pin opening **12** is in the first side attachment member **8**, and the second pin **13** is fixedly attached to the cap **5** and the second pin opening **12** is in the second side attachment member **26**. Preferably, the first restraint extension **18** of the first pin **13** is one or more lobes **18** that extend beyond the circumference **15** of the body **14** and the circumference **19** of the first pin opening **12**, and the first restraint extension **18** of the second pin **13** is one or more lobes **18** that extend beyond the circumference **15** of the body **14** and the circumference **19** of the second pin opening **12**. Preferably, the first pin opening **12** has one or more open lobes **20** that extend beyond the circumference **19** of the first pin opening **12**. The fixedly attached first pin **13** is preferably inserted through the first pin opening **12** in an orientation that permits the one or more lobes **18** on the first pin **13** to pass through the one or more open lobes **20** of the first pin opening **12**, and the cap **5** and the first side attachment member **8** are then rotated on the first pin connection **11** so that the one or more lobes **18** on the first pin **13** no longer match the one or more open lobes **20** of the first pin opening **12**, thereby restraining the cap **5** and the first side attachment member **8** from being separated at the first pin connection **11**. Preferably, the second pin opening **12** has one or more open lobes **20** that extend beyond the circumference **19** of the second pin opening **12**. The fixedly attached second pin **13** is preferably inserted through the second pin opening **12** in an orientation that permits the one or more lobes **18** on the second pin **13** to pass through the one or more open lobes **20** of the second pin opening **12**, and the cap **5** and the second side attachment member **26** are then rotated on the second pin connection **29** so that the one or more lobes **18** on the second pin **13** no longer match the one or more open lobes **20** of the second pin opening **12**, thereby restraining the cap **5** and the second side attachment member **26** from being separated at the first pin connection **29**.

Preferably, the cap **5** additionally comprises a substantially planar top attachment portion **21** that interfaces with the supported structural member **3**. The second substantially planar side attachment portion **22** of the cap **5** is attached to the substantially planar top attachment portion **21**. Preferably, the first side attachment member **8** additionally comprises an edge **37** on said substantially planar attachment portion **9** and the connection portion **10** of the first side attachment member **8** is attached to the edge **37**. Preferably, the second side attachment member **26** additionally comprises an edge **37** and the connection portion **10** of the second side attachment member **26** is attached to the edge **37**.

As best shown in FIG. **3**, the substantially planar attachment portions **9** preferably each have two parallel long edges **37** and two short edges **37** that connect the long side edges **37**. The short edge **37** farthest away from the connection portion **10** preferably meets both the long edges **37** at right angles. The short edge **37** nearest the connection portion **10** preferably meets the long edges **37** at 8.14 degrees off of orthogonal, so that the long edge **37** to which the connection portion **10** is attached is longer than the opposite long edge **37**.

Preferably, the substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** additionally comprise fastener openings **55**. Preferably, the connection **1** additionally comprises fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, and the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**. Preferably, the fasteners **57** that that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** are masonry screw anchors **57**, and the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are self-drilling wood screws **58**.

Preferably, the first end **16** of the first pin **13** is welded to the cap **5**, and the first end **16** of the second pin **13** is welded to the cap **5** with a circumferential fillet weld **39**. Preferably, the connection portion **10** of the first side attachment member **8** is welded to the edge **37**, and the connection portion **10** of the second side attachment member **26** is welded to the edge **37** with a pair of fillet welds **39**. As shown in FIG. **3**, the edge **37** to which the connection portion **10** is welded has an indentation **40** between the fillet welds **39** that attach the connection portion **10**. Preferably, as shown in FIG. **4**, the connection portion **10** has a pair of opposed notches **41** on its circumference that act as visual indicia for correct alignment when welding the connection portion **10** to the substantially planar attachment portion **9**. As shown in FIG. **5**, the substantially planar attachment portion includes a small peg **42** that projects from the edge **37** to interlock with one of the notches **41** and provide further assistance in aligning the connection portion **10**. Preferably, the connector **4** is painted.

Preferably, the substantially planar attachment portions **9** of the first and second side attachment members **8** and **26** are 24 3/16" from the centerlines of the pins **13** to the short edge **37** furthest away from the connection portion **10**. Preferably, as shown in FIGS. **1**A-**1**D, **3**, **10**, **11**, **16**, **19**, **20** and **23**, the substantially planar attachment portions **9** each have four fastener openings **55**, and preferably only two of each set of four is used. The most preferred fasteners **57** for attaching to the supporting structural member **2** are Simpson Strong-Tie TITEN HD masonry screw anchors **57**. If the supporting structural member **2** is a wood wall **2**, the most preferred fasteners **57** would be a greater plurality of Simpson Strong-Tie Strong Drive SDS self-drilling wood screws. Preferably, the clearance diameter of the pin openings **12** is 1.344" and the outer diameter of the connection portion **10** is 4.210". The pins **13** are preferably machined from 1¾" Grade 36 diameter hot rolled bar stock with CNC lathes and machining centers. The first ends **16** of the pins **13** preferably have a D-shaped circumference and, as shown in FIG. **46**, are inserted in D-shaped fixture openings **30** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5**. The pins **13** are then preferably welded in those fixture openings **30** with circumferential fillet welds **39**. The cap **5** is preferably fastened to the supported structural member **3** with twelve fasteners **58**, preferably self-driving wood screws **58**, most preferably Simpson Strong-Tie Strong Drive SDS ¼" screws, 3" long if the supporting structural member **3** is sufficiently wide. If the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are two separate plates **6** and **22** attached to the sides **53** of the supported structural member **3**, as is preferred for retrofit installations,

the plates **6** and **22** are preferably attached with eighteen fasteners **58**, preferably self-driving wood screws **58**, most preferably Simpson Strong-Tie Strong Drive SDS ¼×3 screws. The cap **5** is preferably made in several widths for double, triple, quadruple and quintuple-ply trusses 3, 3.5", 5.062", 7.25" and 8.312" wide respectively. Preferably, the cap **5** and first and second side attachment members **8** and **26** are formed from 3 gauge Grade 33 hot rolled steel.

Fourth Preferred Embodiment

In the fourth preferred embodiment, the first pins **13** are fixedly attached to the first and second side attachment members **8** and **26** and the first pin openings **12** are in the cap **5**. As with the second preferred embodiment, this particular arrangement, according to which the first pin **13** is fixedly attached to the first side attachment member **8**, is similar to fixedly attaching the first pin **13** to the cap **5** and is, therefore, not shown in the drawings. This is less preferred than attaching the first pins **13** to the cap member **5**, but it would be a functional alternative. Preferably, the first pin **13** is fixedly attached to the first side attachment member **8** and the first pin opening **12** is in the cap **5**, and the second pin **13** is fixedly attached to the second side attachment member **26** and the second pin opening **12** is in the cap **5**. Preferably, the first restraint extension **18** on the first pin **13** is one or more lobes **18** that extend beyond the circumference **15** of the body **14** and the circumference **19** of the first pin opening **12**. Preferably, the first restraint extension **18** on the second pin **13** is one or more lobes **18** that extend beyond the circumference **15** of the body **14** and the circumference **19** of the second pin opening **12**. Preferably, the first pin opening **12** has one or more open lobes **20** that extend beyond the circumference **19** of the first pin opening **12**. Preferably, the fixedly attached first pin **13** is inserted through the first pin opening **12** in an orientation that permits the one or more lobes **18** on the first pin **13** to pass through the one or more open lobes **20** of the first pin opening **12**, and the cap **5** and the first side attachment member **8** are then rotated on the first pin connection **11** so that the one or more lobes **18** on the first pin **13** no longer match the one or more open lobes **20** of the first pin opening **12**, thereby restraining the cap **5** and the first side attachment member **8** from being separated at the first pin connection **11**. Preferably, the second pin opening **12** has one or more open lobes **20** that extend beyond the circumference **19** of the second pin opening **12**. The fixedly attached second pin **13** is preferably inserted through the second pin opening **12** in an orientation that permits the one or more lobes **18** on the second pin **13** to pass through the one or more open lobes **20** of the second pin opening **12**, and the cap **5** and the second side attachment member **26** are then rotated on the second pin connection **29** so that the one or more lobes **18** on the second pin **13** no longer match the one or more open lobes **20** of the second pin opening **12**, thereby restraining the cap **5** and the second side attachment member **26** from being separated at the first pin connection **29**.

Preferably, the cap **5** additionally comprises a substantially planar top attachment portion **21** that interfaces with the supported structural member **3**. Preferably, the second substantially planar side attachment portion **22** of the cap **5** is attached to the substantially planar top attachment portion **21**. Preferably, the first side attachment member **8** additionally comprises an edge **37** on said substantially planar attachment portion **9** and the connection portion **10** of the first side attachment member **8** is attached to the edge **37**. Preferably, the second side attachment member **26** additionally comprise an edge **37** and the connection portion **10** of the second side attachment member **26** is attached to the edge **37**.

Preferably, the substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** additionally comprise fastener openings **55**. Preferably, the connection **1** additionally comprises fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, Preferably, the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**. Preferably, the fasteners **57** that that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** are masonry screw anchors **57**. Preferably, the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are self-drilling wood screws **58**.

Preferably, the first end **16** of the first pin **13** is welded to the first side attachment member **8**, and the first end **16** of the second pin **13** is welded to the second side attachment member **26**. The connection portion **10** of the first side attachment member **8** is preferably welded to the edge **37**, and the connection portion **10** of the second side attachment member **26** is preferably welded to the edge **37**. Preferably, the connector **4** is painted.

Fifth Preferred Embodiment

As shown in FIGS. **29**, **34-37** and **28**B, in the fifth preferred embodiment the first pin opening **12** is preferably in the cap **5**, the first attachment member **8** additionally comprises a second pin opening **12** and the first pin **13** passes through the second pin opening **12**, and the first pin **13** additionally comprises a second restraint extension **18** that extends beyond the circumference **15** of the body **14**. The pin openings **12** in the cap **5** and the first attachment member **8** preferably face each other side-by-side. Preferably, the second pin opening **12** has a circumference **19**, and the second restraint extension **18** extends beyond the circumference **19** of the second pin opening **12**, preventing the first pin **13** from withdrawing from the second pin opening **12**.

Preferably, the first restraint extension **18** is a circumferential flange **18** that extends beyond the circumference **15** of the body **14** and the circumference **19** of the first pin opening **12**. The second restraint extension **18** is a circumferential flange **18** that extends beyond the circumference **15** of the body **14** and the circumference **19** of the second pin opening **12**. In this form, the cap member **5** and the first side attachment member **8** cannot be separated without disassembling the pin **13** itself, which is not possible in the preferred form of the pin **13**, which is a rivet.

Preferably, the cap **5** additionally comprises a substantially planar top attachment portion **21** that interfaces with the supported structural member **3**. Preferably, the cap **5** additionally comprises a second substantially planar side attachment portion **22** that interfaces with the supported structural member **3**.

Preferably, as shown in FIG. **29**, the connection portion **10** of the first side attachment member **8** additionally comprises a reinforcing embossment **25** around the first pin opening **12** in the first side attachment member **8**. The embossment **25** reinforces the first pin opening **12** by stiffening the material around the first pin opening **12**. Preferably, the first substantially planar side attachment portion **6** of the cap **5** additionally comprises a reinforcing embossment **25** around the second pin opening **12** that matches the reinforcing embossment **25** around the first pin opening **12** in the first side attachment member **8** so that the reinforcing embossment **25** and the reinforcing embossment **25** fit together and transmit bearing forces between the cap **5** and the first side attachment member **8**. The reinforcing embossments **25** are shown in FIGS. **35-37**, **38**B and **40**.

Preferably, the substantially planar attachment portion **9** of the first side attachment member **8** additionally comprises a reinforcing flange **23**. Preferably, the connection portion **10** of the first side attachment member **8** additionally comprises a reinforcing flange **24**. The reinforcing flanges **23** and **24** are shown in FIGS. **39-41**. The embossments **25** and the reinforcing flanges **23** and **24** are particularly important when the connector **4** is made of lighter gauge sheet steel. The heavier gauge steel of the welded and painted forms of the connector **4** do not require the embossments **25** and reinforcing flanges **23** and **24**.

Preferably, as shown in FIG. **38**B, the first pin **13** is a rivet. The first pin **13** could also be made as a press fit part, but the restraint extensions **18** of a rivet are stronger.

Preferably, as shown in FIG. **38**A, the substantially planar side attachment portion **9** of the first side attachment member **8** additionally comprises fastener openings **55**, and the connection **1** additionally comprises fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, and the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**. Preferably, the fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** are masonry screw anchors **57**, and the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are self-drilling wood screws **58**.

Sixth Preferred Embodiment

As shown in FIG. **38**A, the sixth preferred embodiment is essentially the same as the fifth preferred embodiment, except that it is double-sided. The preferred side attachment member **8** or **26** is shown FIGS. **29** and **24**, but other side attachment members **8** or **26** could be used, including those shown in FIGS. **39-4**. The cap member **5** additionally comprises a second substantially planar side attachment portion **22** that interfaces with the supported structural member **3**. The connector additionally comprises a second side attachment member **26** comprising a substantially planar attachment portion **9** that interfaces with and is fastened to the supporting structural member **2**, and a connection portion **10** that is positioned alongside said second substantially planar side attachment portion **22** of said cap **5**. Preferably, a second pin connection **29** that enables rotation between the second side attachment member **26** and the cap **5**. The second pin connection **29** preferably further comprises a third pin opening **12** in the cap **5** and a fourth pin opening **12** in the second side attachment member **26**, and a second pin **13** that passes through the third pin opening **12** and the fourth pin opening **12**. Preferably, the second pin **13** comprises a body **14** having a circumference **15**, a first end **16** with a second restraint extension **18** that extend beyond the circumference **19**, and a second end **17** with a first restraint extension **18** that extends beyond the circumference **15** of the body **14**. The third pin opening **12** preferably has a circumference **19** and the fourth pin opening **12** has a circumference **19**. Preferably, the first restraint extension **18** of the second pin **13** extends beyond the circumference **19** of the third pin opening **12**, preventing the second pin **13** from withdrawing from the third pin opening **12**. The second restraint extension **18** of the second pin **13** preferably extends beyond the circumference **19** of the fourth pin opening **12**, preventing the second pin **13** from withdrawing from the fourth pin opening **12**.

Preferably, the first restraint extension **18** of the first pin **13** is a circumferential flange **18** that extends beyond the circumference **15** of the body **14**. The second restraint extension **18** of the first pin **13** preferably is a circumferential flange **18** that extends beyond the circumference **15** of the body **14**, and the first restraint extension **18** of the first pin **13** is a circumferential flange **18** that extends beyond the circumference **15** of the body **14**. Preferably, the second restraint extension **18** of the first pin **13** is a circumferential flange **18** that extends beyond the circumference **15** of the body **14**.

As previously described, preferably the cap **5** additionally comprises a substantially planar top attachment portion **21** that interfaces with the supported structural member **3**. Preferably, the cap **5** additionally comprises a second substantially planar side attachment portion **22** that interfaces with the supported structural member **3**. Preferably, the connection portion **10** of the first side attachment member **8** additionally comprises a reinforcing embossment **25** around the second pin opening **12** in the first side attachment member **8**. Preferably, the connection portion **10** of the second side attachment member **9** additionally comprises a reinforcing embossment **25** around the fourth pin opening **12** in the second side attachment member **9**. Preferably, the first substantially planar side attachment portion **6** of the cap **5** additionally comprises a reinforcing embossment **25** around the first pin opening **12** that matches the reinforcing embossment **25** around the second pin opening **12** in the first side attachment member **8** so that the reinforcing embossment **25** in the first substantially planar side attachment portion **6** and the reinforcing embossment **25** fit together and transmit bearing forces between the cap **5** and the first side attachment member **8**. Preferably, the second substantially planar side attachment portion **22** of the cap **5** additionally comprises a reinforcing embossment **25** around the third pin opening **12** that matches the reinforcing embossment **25** around the fourth pin opening **12** in the second side attachment member **26** so that the reinforcing embossment **25** in the second substantially planar side attachment portion **22** and the reinforcing embossment **25** in the second side attachment member **26** fit together and transmit bearing forces between the cap **5** and the second side attachment member **26**.

Preferably, the first pin **13** is a rivet, and the second pin **13** is a rivet.

Preferably, the substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** additionally comprise fastener openings **55**. Preferably, the connection **1** additionally comprises fasteners

57 that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, and the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**. Preferably, the fasteners **57** that that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** are masonry screw anchors **57**. Preferably, the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are self-drilling wood screws **58**.

As described above, the sixth preferred embodiment of the invention can be used with a variety of side members **8** and **26**. The following is a description of the use of the side members **8** and **26** shown in FIGS. **39-41**. The substantially planar attachment portion **9** of the first side attachment member **8** additionally comprises a reinforcing flange **23**, and the substantially planar attachment portion **9** of the second side attachment member **26** additionally comprises a reinforcing flange **23**. Preferably, the connection portion **10** of the first side attachment member **8** additionally comprises a reinforcing flange **24**, and the connection portion **10** of the second side attachment member **9** additionally comprises a reinforcing flange **24**.

Preferably, the first and second side attachment members **8** and **26** are 25" long and 4" wide. Preferably, they are each attached to the supporting structural member **2** with 5 fasteners **57**, preferably masonry screw anchors **57**, most preferably ⅝" diameter×6" long Simpson Strong-Tie TITEN HD anchors. As shown in FIGS. **39-41**, the connection portions **10** are preferably bent out of the material of the first and second side attachment members **8** and **26** so that they are orthogonal to the substantially planar attachment portions **9**, forming a P-shape in which the head of the P is the connection portion **10** and the leg of the P is the substantially planar attachment portion **9**. FIGS. **25-27** show a P-shaped first or second side attachment member **8** or **26**, in which the head of the P is the connection portion **10** and the leg of the P is the substantially planar attachment portion **9**, but the embodiment shown in FIGS. **25-27** is used with a fixed pin **13** attached to the cap **5**. As shown in FIGS. **39-41**, the juncture between the head and leg of the P in this P-shaped embodiment is preferably reinforced with gussets **43**. The connection portion **10** is preferably is 3.76" in diameter. Preferably, the first and second side attachment members **8** and **26** and the cap **5** are all formed from 12 gauge (0.1" thick) galvanized sheet steel. The reinforcing flanges **23** of the first and second side attachment members **8** and **26** are preferably on both the substantially planar attachment portions **9** and the connection portions **10**, as shown in FIGS. **39-41**, and are preferably ⅝" high. The pin openings **12** are preferably 1" in diameter and the pins **13** themselves are preferably 1" diameter rivets **13**. The reinforcing embossments **25** around the pin openings **12** in the cap **5** and the first and second side attachment members **8** and **26** are preferably ¼" deep.

Seventh Preferred Embodiment

The seventh preferred embodiment is shown in FIGS. **29**, **34**, **35-37**, **38**A and **38**B. In it, the first side attachment member **8** is formed by bending a V-shaped length of steel in half to form a two-ply substantially planar attachments portion **9** and a connection portion **10** that joins the plies. The apex of the V is formed with a teardrop shape (that becomes the connection portion **10**) and the straps (which become the substantially planar attachment portion **9**) branch out at a narrow angle that allows them to be folded together to form a single substantially planar attachment portion **9**.

Preferably, the substantially planar side attachment portion **9** of the first side attachment member **8** additionally comprises fastener openings **55**, and the connection **1** additionally comprises fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, and the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**. Preferably, the fasteners **57** that that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** are masonry screw anchors **57**, and the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are self-drilling wood screws **58**.

Eighth Preferred Embodiment

The eighth preferred embodiment is essentially the same as the seventh preferred embodiment, except that it is double-sided. In it, the first side attachment member **8** is formed by bending a V-shaped length of steel in half to form a two-ply substantially planar attachment portion **9** and a connection portion **10** that joins the plies. The second side attachment member **26** is also formed by bending a V-shaped length of steel in half to form a two-ply substantially planar attachment portion **9** and a connection portion **10** that joins the plies.

Preferably, the substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** additionally comprise fastener openings **55**. Preferably, the connection **1** additionally comprises fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side attachment member **26** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**, and the connection **1** additionally comprises fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**. Preferably, the fasteners **57** that that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and the substantially planar side attachment portion **9** of the second side

attachment member **26** are masonry screw anchors **57**. Preferably, the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** are self-drilling wood screws **58**.

Preferably, the first and second side attachment members **8** and **26** are 22⅛" long and 2" wide. Preferably, they are each attached to the supporting structural member **2** with 5 fasteners **57**, preferably masonry screw anchors **57**, most preferably ½" diameter×6" long Simpson Strong-Tie TITEN HD anchors. Preferably, the connection portion **10** is 3¾" in diameter. Preferably, the first and second side attachment members **8** and **26** and the cap **5** are all formed from 10 gauge (0.135" thick) galvanized sheet steel. Preferably, the connection portions **10** are canted 10 degrees out of line from the substantially planar attachment portions **9** of the first and second side attachment member **8** and **26**, so that the substantially planar side attachment portions **9** angle outward from the supported structural member **3**, as shown in FIG. **38**A. As shown in FIGS. **29**, **24** and **38**B and **38**B, the reinforcing flanges **23** of the first and second side attachment members **8** and **26** extend between the connection portion **10** and the substantially planar attachment portion **9** and are preferably 0.38" high in the connection portion **10**. The pin openings **12** are preferably 1" in diameter and the pins **13** themselves are preferably 1" diameter rivets **13**.

In retrofit or new construction application using caps **5** that have no substantially planar top attachment portion **21** and only a first substantially planar side attachment portion **6** or only first and second substantially planar side attachment portions **6** and **22**, the first side attachment member **8** or the first and second side attachment members **8** and **26**, if there are two, are first connected to the cap **5**, if they have detachable pins **13**. Second, the substantially planar side attachment portions **6** and **22** are aligned so that they are flush with the top **54** of the truss **3** and the first and second side attachment members **8** and **26** are vertical and in contact with the side **51** of the wall **2**. Third, the substantially planar side attachment portions **6** and **22** are attached to the truss **3** with fasteners **58** and the first and second side attachment members **8** and **26** are attached to the wall with fasteners **57**.

In new construction application using caps **5** that have a substantially planar top attachment portion **21**, the first and second side attachment members **8** and **26**, are first connected to the cap **5**, if they have detachable pins **13**. Second, the substantially planar top attachment portion **21** of the cap **5** is placed on the top **54** of the truss **3**, which aligns the substantially planar side attachment portions **6** and **22** so that they are flush with the top **54** of the truss **3** and the first and second side attachment members **8** and **26** are vertical and in contact with the side **51** of the wall **2**. Third, the substantially planar side attachment portions **6** and **22** are attached to the truss **3** with fasteners **58** and the first and second side attachment members **8** and **26** are attached to the wall with fasteners **57**.

Generally, only caps **5** without substantially planar top attachment portions **21** will be used in retrofit applications because substantially planar top attachment portions **21** would interfere with roof sheathing on top of the trusses **3**. If there is enough space between any roof sheathing and the tops **54** of the trusses **3**, L-shaped caps **5** with only a first substantially planar side attachment portion **6** and a substantially planar top attachment portion **21** could be used by sliding the substantially planar top attachment portion **21** between the top **54** of the truss **3** and the roof sheathing. If there is no roof sheathing, as in new construction, caps **5** with first and second substantially planar side attachment portions **6** and **22** and a substantially planar top attachment portion **21** can be used and are preferable because they require fewer fasteners **58** to attach them to the truss **3** since the substantially planar top attachment portion **21** primarily holds down the truss **3**.

Most Preferred Embodiments

There are three most preferred embodiments. The first is shown in FIGS. **11-16**), the second in FIG. **18**, and the third in FIGS. **19-23**. These are suitable for both retrofit and new construction, having caps **5** that have a separate first substantially planar side attachment portion **6** and a separate second substantially planar side attachment portion **22**, and no connecting substantially planar top attachment portion **21** which can interfere with roof sheathing.

Unadjustable Embodiments

In addition to the adjustable embodiments of the present invention, there are unadjustable embodiments, shown in FIGS. **50-58**, in which the side attachment members connected directly to the supported structural members, rather than by jointed attachment to a cap that interfaces with the supported structural member.

At their most basic, the unadjustable embodiments of the present invention are all a connection, as shown in FIGS. **57** and **58**, that comprises an elongate substantially vertical supporting structural member **2**, an elongate generally horizontal supported structural member **3**, and a first connector **4**. The elongate substantially vertical supporting structural member **2** has two sides **51** and a top **52**. The elongate generally horizontal supported structural member **3** is not parallel to the supporting structural member **2**, has two sides **53** and a top **54**, and is supported by the supporting structural member **2**. The first connector **4** has a first side attachment member **8**.

The first side attachment member has a connection portion **10** and an elongate substantially planar attachment portion **9**. The connection portion **10** has a substantially planar fastening portion **47** with a border **31**, and a reinforcing flange **24** integrally joined to the fastening portion **47** along at least part of the border **31**. The elongate substantially planar attachment portion **9** comprises first and second straps **28**, each having an inner side **59** and an outer side **60**, integrally connected to the connection portion **10**.

The reinforcing flange **24** has a left side **48** and a right side **49**. The reinforcing flange **24** can be discontinuous. The first strap **28** is integrally connected to the left side **48** of the reinforcing flange **24** and the second strap **28** is integrally connected to the right side **49** of the reinforcing flange **24**. The first and second straps **28** at least partially overlap each other, the inner sides **59** interfacing. The fastening portion **47** is positioned alongside and fastened to one of the two sides **53** of the supported structural member **3**. The attachment portion **9** interfaces with and is fastened to one of the two sides **51** of the supporting structural member **2**.

Preferably, the fastening portion **47** and the attachment portion **9** generally occupy substantially perpendicular planes. The greater part of the first and second straps **28** preferably overlap. Preferably, the first and second straps **28** have open ends **50** opposite the connection portion **10** and the open ends **50** are equidistant from the connection portion. The greater part of the first and second straps **28** preferably overlap and the open ends **50** preferably contact each other. The straps **28** are preferably 18" long. Preferably, the straps **28** have two parallel long sides **44**, one that faces the supported structural member **3** and one that faces away from the supported structural member **3**. The angle between the long sides **44** and the fastening portion **47** is preferably 10 degrees, so

that the straps **28** are not vertical when installed as preferred. The first and second straps **28** extend the material of the reinforcing flange **24**, extending outward from the connection portion **10** and being brought together as close to the connection portion **10** as possible. The straps **28** are bent at a bend **45** so that they interface for almost their entire length.

The reinforcing flange **24** preferably occupies substantially all of the border **31**. Preferably, the reinforcing flange **24** has a first end **35** and a second end **36**, the first end **35** and the second end **36** being separated by a first gap **38** along the border **31** of the connection portion **10**. The reinforcing flange **24** preferably rises a uniform 0.5" from the connection portion **10** border **31**, except that is rises further as it transitions into the straps **28**.

Preferably, the first and second straps **28** have fastener openings **55**, and the fastening portion **47** has fastener openings **32**. The connection **1** preferably includes fasteners **57** that pass through the fastener openings **55** in the first and second straps **28** and into the supporting structural member **2**. The connection **1** preferably also includes fasteners **33** that pass through the fastener openings **32** in the fastening portion **47** and into the supported structural member **3**. Preferably, the fasteners **57** that pass through the fastener openings **55** in the first and second straps **28** have shanks **34**, and the fasteners **33** that pass through the fastener openings **32** in the fastening portion **47** have shanks **34**. The fasteners **57** that pass through the fastener openings **55** in the first and second straps **28** preferably have threaded shanks **34**, and fasteners **33** that pass through the fastener openings **32** in the fastening portion **47** preferably have threaded shanks **34**. Preferably, the fasteners **57** that pass through the fastener openings **55** in the first and second straps **28** are screws **57**, and the fasteners **33** that pass through the fastener openings **32** in the fastening portion **47** are screws **33**.

If the supporting structural member **2** is a wood-framed wall **2**, the screws **57** that pass through the fastener openings **55** in the first and second straps **28** are preferably wood screws **57**. Most preferably, the screws **57** are Simpson Strong-Drive ¼" wood screws. The Simpson Strong-Drive wood screw has a hex washer head for easy driving with a ⅜" hex head socket and a low speed drill. The built-in reamer and type **17** tip cuts a hole to allow installation without predrilling. If the supporting structural member **2** is a masonry wall **2**, the screws **57** that pass through the fastener openings **55** in the first and second straps **28** are preferably masonry screws **57**. Most preferably, the screws **57** are Simpson Titen masonry screws. Titen screws are 3/16 and ¼ diameter masonry screws for attaching all types of components to concrete and masonry. If the supporting structural member **2** is a metal-framed wall **2**, the screws **57** that pass through the fastener openings **55** in the first and second straps **28** are preferably metal screws **57**. Preferably, fourteen screws **57** connect the attachment portions **9** to the supporting structural member **2**.

If the supported structural member **3** is a wood-framed truss **3**, the screws **33** that pass through the fastener openings **32** in the fastening portion **47** are preferably wood screws **33**. If the supported structural member **3** is a composite truss **3**, the fasteners **33** that pass through the fastener openings **32** in the fastening portion **47** preferably are those best suited to the material of the member or members to which the connection portion **10** is attached. If the supported structural member **3** is a metal-framed truss **3**, the screws **33** that pass through the fastener openings **32** in the fastening portion **47** are preferably metal screws **33**.

The connection **1** is preferably a double-sided connection **1**, having second connector **7** essentially identical to the first connector **4**. The second connector **7** has a first side attachment member **8**. The first side attachment member has a connection portion **10** and an elongate substantially planar attachment portion **9**. The connection portion **10** has a substantially planar fastening portion **47** with a border **31**, and a reinforcing flange **24** integrally joined to the fastening portion **47** along at least part of the border **31**. The elongate substantially planar attachment portion **9** comprises first and second straps **28**, each having an inner side **59** and an outer side **60**, integrally connected to the connection portion **10**. The reinforcing flange **24** has a left side **48** and a right side **49**. The first strap **28** is integrally connected to the left side **48** of the reinforcing flange **24** and the second strap **28** is integrally connected to the right side **49** of the reinforcing flange **24**. The first and second straps **28** at least partially overlap each other, the inner sides **59** interfacing. The fastening portion **47** is positioned alongside and fastened to the other of the two sides **53** of the supported structural member **3** from the first connector **4**. The attachment portion **9** interfaces with and is fastened to one of the two sides **51** of the supporting structural member **2**.

Preferably, the connector **4** of the present invention is formed first by cutting a substantially planar blank **100** from sheet metal. The substantially planar blank **100** preferably has a connection portion **10** and an elongate substantially planar attachment portion **9**. Preferably, the connection portion **10** has a substantially planar fastening portion **47** with a border **31**. The elongate substantially planar attachment portion **9** preferably comprises first and second straps **28**, each having an inner side **59** and an outer side **60**, integrally connected to the connection portion **10**. Preferably, a reinforcing flange **24** is then bent up along at least part of the border **31**, the reinforcing flange (**24**) being integrally joined to the fastening portion **47** and having a left side **48** and a right side **49**. The first strap **28** preferably is integrally connected to the left side **48** of the reinforcing flange **24** and the second strap **28** is integrally connected to the right side **49** of the reinforcing flange **24**. Preferably, the first and second straps **28** are bent up and together at the same time as the reinforcing flange (**24**) such that the first and second straps **28** at least partially overlap each other, the inner sides **59** interfacing. The connector **4** of the present invention is preferably further formed by punching fastener openings **55** in the first and second straps **28**, and by punching fastener openings **32** in the fastening portion **47**. The preferred material is 10 gauge (118 mils) G90 zinc-coated (0.90 oz/ft^2) galvanized sheet steel with a minimum yield strength of 33 ksi (kip [1000 pounds] per square inch) designated GR33.

Preferably, the attachment portion **9** equally bifurcates the connection portion **10** where the attachment portion **9** is integrally connected to the connection portion **10**. The connection portion **10** has a top point **46** on the border **31** that is farthest away from the attachment portion **9**.

In a first preferred embodiment best shown in FIGS. **50** and **51** the connection portion **10** is substantially teardrop-shaped, the narrowest part being where the attachment portion **9** joins the connection portion **10**, curving outward to widen on either side of the attachment portion **9** and then curving together to narrow again, coming to a point at the top point **46**. The first preferred embodiment preferably has seven fastener openings **32** in the fastening portion **47** and all are used to attach the connection portion **10** to the supported structural member **3**.

In a second preferred embodiment shown in FIGS. **52** and **53**, the connection portion **10** is generally formed as an irregular quadrilateral with four corners **120**, three of which are rounded, the connection portion **10** being symmetrical to either side of the attachment portion, the attachment portion **9**

joining the connection near the fourth of the four corners **120**, the fourth corner **120** tapering to an acute and toward the attachment portion **9**. Preferably, one of the rounded corners **120** is opposite the fourth corner **120** and the top point **46** is at the midpoint of the rounded corner **120** opposite the fourth corners.

In the second preferred embodiment the connection portion **10** widens from its narrowest portion, where the attachment portion **9** joins the connection portion **10**, the border **31** diverging symmetrically, forming a first straight side **101** and a second straight side **102** at an acute angle to the first straight side **101**, then curving out to form a third straight side **103** and a fourth straight side **104** at an obtuse angle to the third straight side **103**, then curving in to form a fifth straight side **105** and a sixth straight side **106** that meet at an obtuse angle opposite the attachment portion **9** across the connection portion **10**, the obtuse angle being centered on the top point **46**. The fifth and sixth straight sides **105** and **106** preferably are angled to match the pitch of a truss top chord with a ½ pitch. The second preferred embodiment preferably has thirteen fastener openings **32** in the fastening portion **47** and all are used to attach the connection portion **10** to the supported structural member **3**.

In a third preferred embodiment shown in FIGS. **55-57**, the connection portion **10** extends symmetrically to either side of the attachment portion **9**, narrows and then widens again. In the third preferred embodiment, the connection portion **10** widens from its narrowest portion, where the attachment portion **9** joins the connection portion **10**, the border **31** diverging symmetrically, forming a first straight side **101** and a second straight side **102** at an acute angle to the first straight side **101**, then curving out to form a third straight side **103** and a fourth straight side **104** at an obtuse angle to the third straight side **103**, then curving further out to form a fifth straight side **105** and a sixth straight side **106** at an acute angle to the fifth straight side **105**, then curving in to form a seventh straight side **107** and an eighth straight side **108** in line with the seventh straight side **107** and substantially orthogonal to the attachment portion **9**, then turning in at right angles to form a ninth straight side **109** and a tenth straight side **110** parallel to the ninth straight side **109**, then turning in to form an eleventh straight side **111** and a twelfth straight side **112** that meet at an obtuse angle opposite the attachment portion **9** across the connection portion **10**. In the third preferred embodiment, the reinforcing flange **24** reinforces all of the border **31** except the ninth straight side **109** and the tenth straight side **110**. The eleventh and twelfth straight sides **111** and **112** preferably are angled to match the pitch of a truss top chord with a ½ pitch. The third preferred embodiment preferably has thirty-five fastener openings **32** in the fastening portion **47** and twenty-eight are used to attach the connection portion **10** to the supported structural member **3**.

Adjustable Embodiments

At their simplest, the light gauge steel embodiments of the present invention are all a connection **1** comprising an elongate substantially vertical supporting structural member **2**, an elongate generally horizontal supported structural member **3**, and a connector **4**, as shown in FIGS. **47-49**. The elongate substantially vertical supporting structural member **2**, further comprises two sides **51** and a top **52** and supports the elongate generally horizontal supported structural member **3**. The elongate generally horizontal supported structural member **3** further comprises two sides **53** and a top **54**, and it is not parallel to the elongate substantially vertical supporting member **2**. The connector **4** comprises a cap **5**, a first side attachment member **8**, and a first pin connection **11**. The cap **5** is connected to the supported structural member **3**, and comprises a first substantially planar side attachment portion **6** that interfaces with the supported structural member **3**. The first side attachment member **8** comprises a substantially planar attachment portion **9** that interfaces with and is fastened to the supporting structural member **2**, and a connection portion **10** that is positioned alongside the first substantially planar side attachment portion **6** of the cap **5**. The first pin connection **11** enables rotation between the cap **5** and the first side attachment member **8**, and connects the cap **5** to the first attachment member **8**.

As with the unadjustable embodiments, preferably the connection portion **10** has a substantially planar fastening portion **47** with a border **31**, and a reinforcing flange **24** integrally joined to the fastening portion **47** along at least part of the border **31**. The elongate substantially planar attachment portion **9** preferably comprises first and second straps **28**, each having an inner side **59** and an outer side **60**. Preferably, the reinforcing flange **24** has a left side **48** and a right side **49**. The first strap **28** preferably is integrally connected to the left side **48** of the reinforcing flange **24** and the second strap **28** preferably is integrally connected to the right side **49** of the reinforcing flange **24**. Preferably, the first and second straps **28** at least partially overlap each other, the inner sides **59** interfacing. The reinforcing flange **24** preferably has a first end **35** and a second end **36**, the first end **35** and the second end **36** being separated by a first gap **38** along the border **31** of the connection portion **10**. Preferably, the connection portion **10** has a top point **46** on the border **31** that is farthest away from the attachment portion **9**. The connection portion **10** preferably is substantially teardrop-shaped, the narrowest part being where the attachment portion **9** joins the connection portion **10**, curving outward to widen on either side of the attachment portion **9** and then curving together to narrow again, coming to a point at the top point **46**.

Preferably, the first pin connection **11** further comprises a first pin opening **12** in one of the cap **5** and the first side attachment member **8**, and a first pin **13** that passes through the first pin opening **12**. The first pin **13** preferably comprises a body **14** having a circumference **15**, a first end **16**, and a second end **17** with a first restraint extension **18** that extends beyond the circumference **15** of the body **14**. Preferably, the first pin opening **12** has a circumference **19**, and the first restraint extension **18** extends beyond the circumference of the first pin opening **12**, preventing the first pin **13** from withdrawing from the first pin opening **12**.

The first pin opening **12** is preferably in the cap **5**. Preferably, the first attachment member **8** additionally comprises a second pin opening **12** and the first pin **13** passes through the second pin opening **12**. The first pin **13** additionally comprises a second restraint extension **18** that extends beyond the circumference **15** of the body **14**. Preferably, the second pin opening **12** has a circumference **19**. The second restraint extension **18** extends beyond the circumference **19** of the second pin opening **12**, preventing the first pin **13** from withdrawing from the second pin opening **12**.

Preferably, the first restraint extension **18** is a circumferential flange **18** that extends beyond the circumference **15** of the body **14** and the circumference **19** of the first pin opening **12**. The second restraint extension **18** preferably is a circumferential flange **18** that extends beyond the circumference **15** of the body **14** and the circumference **19** of the second pin opening **12**. Preferably, the first pin **13** is a rivet.

Preferably, the cap **5** includes a substantially planar top attachment portion **21** that interfaces with the supported structural member **3**. The cap **5** preferably includes a second

substantially planar side attachment portion **22** that interfaces with the supported structural member **3**. Preferably, the connection portion **10** of the first side attachment member **8** includes a reinforcing embossment **25** around the first pin opening **12** in the first side attachment member **8**. The first substantially planar side attachment portion **6** of the cap **5** preferably includes a reinforcing embossment **25** around the second pin opening **12** that matches the reinforcing embossment **25** around the first pin opening **12** in the first side attachment member **8** so that the reinforcing embossment **25** and the reinforcing embossment **25** fit together and transmit bearing forces between the cap **5** and the first side attachment member **8**. Preferably, the substantially planar attachment portion **9** of the first side attachment member **8** includes a reinforcing flange **23**. The connection portion **10** of the first side attachment member **8** preferably includes a reinforcing flange **24**.

Preferably, the substantially planar side attachment portion **9** of the first side attachment member **8** additionally comprises fastener openings **55**. The connection **1** preferably includes fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** and into the supporting structural member **2**. Preferably, the first and second substantially planar side attachment portions **6** and **22** of the cap **5** additionally comprise fastener openings **56**. The connection **1** preferably includes fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** and into the supported structural member **3**.

If the supporting structural member **2** is a masonry wall, the fasteners **57** that pass through the fastener openings **55** in the first substantially planar side attachment portion **9** of the first side attachment member **8** are preferably masonry screw anchors **57**. If the supported structural member **3** is made of wood, the fasteners **58** that pass through the fastener openings **56** in the first and second substantially planar side attachment portions **6** and **22** of the cap **5** preferably are self-drilling wood screws **58**.

Preferably, the fastening portion **47** and the attachment portion **9** generally occupy substantially perpendicular planes. The greater part of the first and second straps **28** preferably overlap. Preferably, the first and second straps **28** have open ends **50** opposite the connection portion **10** and the open ends **50** are equidistant from the connection portion. The greater part of the first and second straps **28** preferably overlap and the open ends **50** preferably contact each other.

We claim:

1. A connection (**1**) comprising:

a. an elongate substantially vertical supporting structural member (**2**), having two sides (**51**) and a top (**52**);

b. an elongate generally horizontal supported structural member (**3**), not parallel to said supporting structural member (**2**), having two sides (**53**) and a top (**54**), and supported by said supporting structural member (**2**);

c. a first connector (**4**), having a first side attachment member (**8**), said first side attachment member having:

i. a connection portion (**10**), having a substantially planar fastening portion (**47**) with a border (**31**), and a reinforcing flange (**24**) integrally joined to said fastening portion (**47**) along at least part of said border (**31**); and

ii. an elongate substantially planar attachment portion (**9**) comprising first and second straps (**28**), each having an inner side (**59**) and an outer side (**60**), integrally connected to said connection portion (**10**); wherein:

A. said reinforcing flange (**24**) has a left side (**48**) and a right side (**49**);

B. said first strap (**28**) is integrally connected to said left side (**48**) of said reinforcing flange (**24**) and said second strap (**28**) is integrally connected to said right side (**49**) of said reinforcing flange (**24**); and

C. said first and second straps (**28**) at least partially overlap each other, said inner sides (**59**) interfacing; and

iii. said fastening portion (**47**) is positioned alongside and fastened to one of said two sides (**53**) of said supported structural member (**3**); and

iv. said attachment portion (**9**) interfaces with and is fastened to one of said two sides (**51**) of said supporting structural member (**2**).

2. The connection (**1**) of claim **1** wherein:

a. said fastening portion (**47**) and said attachment portion (**9**) generally occupy substantially perpendicular planes.

3. The connection (**1**) of claim **1** wherein:

a. the greater part of said first and second straps (**28**) overlap.

4. The connection (**1**) of claim **1** wherein:

a. said first and second straps (**28**) have open ends (**50**) opposite said connection portion (**10**) and said open ends (**50**) are equidistant from said connection portion.

5. The connection of claim **4** wherein:

a. the greater part of said first and second straps (**28**) overlap and said open ends (**50**) contact each other.

6. The connection (**1**) of claim **1** wherein:

a. said first and second straps (**28**) have fastener openings (**55**); and

b. said fastening portion (**47**) has fastener openings (**32**).

7. The connection (**1**) of claim **6** wherein:

a. said connection (**1**) includes fasteners (**57**) that pass through said fastener openings (**55**) in said first and second straps (**28**) and into said supporting structural member (**2**); and

b. said connection (**1**) includes fasteners (**33**) that pass through said fastener openings (**32**) in said fastening portion (**47**) and into said supported structural member (**3**).

8. The connection (**1**) of claim **7** wherein:

said fasteners (**57** and **33**) have shanks (**34**).

9. The connection (**1**) of claim **8** wherein:

said fasteners (**57** and **33**) have threaded shanks (**34**).

10. The connection (**1**) of claim **9** wherein:

said fasteners (**57** and **33**) are screws (**57** and **33**).

11. The connection (**1**) of claim **10** wherein:

a. said screws (**57**) are wood screws (**57**) and said supporting structural member (**2**) is a wood-framed wall (**2**).

12. The connection (**1**) of claim **10** wherein:

a. said screws (**57**) are masonry screws (**57**) and said supporting structural member (**2**) is a masonry wall (**2**).

13. The connection (**1**) of claim **10** wherein:

a. said screws (**57**) are metal screws (**57**) and said supporting structural member (**2**) is a metal-framed wall (**2**).

14. The connection (**1**) of claim **10** wherein:

a. said screws (**33**) are wood screws (**33**) and said supported structural member (**3**) is a wood-framed truss (**3**).

15. The connection (**1**) of claim **10** wherein:

a. said supported structural member (**3**) is a composite truss (**3**).

16. The connection (**1**) of claim **10** wherein:

a. said screws (**33**) are metal screws (**33**) and said supported structural member (**3**) is a metal-framed truss (**3**).

17. The connection (1) of claim 1 further comprising:
a. a second connector (7) having a first side attachment member (8), said first side attachment member having:
i. a connection portion (10), having a substantially planar fastening portion (47) with a border (31), and a reinforcing flange (24) integrally joined to said fastening portion (47) along at least part of said border (31); and
ii. an elongate substantially planar attachment portion (9) comprising first and second straps (28) each having an inner side (59) and an outer side (60), integrally connected to said connection portion (10); wherein:
A. said reinforcing flange (24) has a left side (48) and a right side (49);
B. said first strap (28) is integrally connected to said left side (48) of said reinforcing flange (24) and said second strap (28) is integrally connected to said right side (49) of said reinforcing flange (24); and
C. said first and second straps (28) at least partially overlap each other, said inner sides (59) interfacing; and
b. said fastening portion (47) is positioned alongside and fastened to the other of said two sides (53) of said supported structural member (3) from said first connector (4); and
c. said attachment portion (9) interfaces with and is fastened to one of said two sides (51) of said supporting structural member (2).

18. The connection (1) of claim 1 wherein:
a. said reinforcing flange (24) occupies substantially all of said border (31).

19. The connection (1) of claim 1 wherein:
a. said attachment portion (9) equally bifurcates said connection portion (10) where said attachment portion (9) is integrally connected to said connection portion (10).

20. The connection (1) of claim 19 wherein:
a. said connection portion (10) has a top point (46) on said border (31) that is farthest away from said attachment portion (9); and
b. said connection portion (10) is substantially teardrop-shaped, the narrowest part being where said attachment portion (9) joins said connection portion (10), curving outward to widen on either side of said attachment portion (9) and then curving together to narrow again, coming to a point at said top point (46).

21. The connection (1) of claim 19 wherein:
a. said connection portion (10) has a top point (46) on said border (31) that is farthest away from said attachment portion (9);
b. said connection portion (10) is generally formed as an irregular quadrilateral with four corners (120), three of which are rounded, said connection portion (10) being symmetrical to either side of said attachment portion, said attachment portion (9) joining said connection near the fourth of said four corners (120), said fourth corner (120) tapering to an acute and toward said attachment portion (9); and
c. one of said rounded corners (120) is opposite said fourth corner (120) and said top point (46) is at the midpoint of said rounded corner (120) opposite said fourth corners.

22. The connection (1) of claim 19 wherein:
a. said connection portion (10) has a top point (46) on said border (31) that is farthest away from said attachment portion (9); and
b. said connection portion (10) widens from its narrowest portion, where said attachment portion (9) joins said connection portion (10), said border (31) diverging symmetrically, forming a first straight side (101) and a second straight side (102) at an acute angle to said first straight side (101), then curving out to form a third straight side (103) and a fourth straight side (104) at an obtuse angle to said third straight side (103), then curving in to form a fifth straight side (105) and a sixth straight side (106) that meet at an obtuse angle opposite said attachment portion (9) across said connection portion (10), said obtuse angle being centered on said top point (46).

23. The connection (1) of claim 1 wherein:
a. said connection portion (10) extends symmetrically to either side of said attachment portion (9), narrows and then widens again.

24. The connection (1) of claim 1 wherein:
a. said connection portion (10) widens from its narrowest portion, where said attachment portion (9) joins said connection portion (10), said border (31) diverging symmetrically, forming a first straight side (101) and a second straight side (102) at an acute angle to said first straight side (101), then curving out to form a third straight side (103) and a fourth straight side (104) at an obtuse angle to said third straight side (103), then curving further out to form a fifth straight side (105) and a sixth straight side (106) at an acute angle to said fifth straight side (105), then curving in to form a seventh straight side (107) and an eighth straight side (108) in line with said seventh straight side (107) and substantially orthogonal to said attachment portion (9), then turning in at right angles to form a ninth straight side (109) and a tenth straight side (110) parallel to said ninth straight side (109), then turning in to form an eleventh straight side (111) and a twelfth straight side (112) that meet at an obtuse angle opposite said attachment portion (9) across said connection portion (10).

25. The connection (1) of claim 24 wherein:
a. said reinforcing flange (24) reinforces all of said border (31) except said ninth straight side (109) and said tenth straight side (110).

26. The connection (1) of claim 1 wherein:
a. said reinforcing flange (24) has a first end (35) and a second end (36), said first end (35) and said second end (36) being separated by a first gap (38) along said border (31) of said connection portion (10).

27. The connection (1) of claim 1 wherein:
a. said connector (4) further comprises:
i. a cap (5), connected to said supported structural member (3), comprising a first substantially planar side attachment portion (6) that interfaces with said supported structural member (3);
ii. a first side attachment member (8) comprising a substantially planar attachment portion (9) that interfaces with and is fastened to said supporting structural member (2), and a connection portion (10) that is positioned alongside said first substantially planar side attachment portion (6) of said cap (5); and
iii. a first pin connection (11) that enables rotation between said cap (5) and said first side attachment member (8), and that connects said cap (5) to said first attachment member (8).

28. The connection (1) of claim 27 wherein:
a. said reinforcing flange (24) has a first end (35) and a second end (36), said first end (35) and said second end (36) being separated by a first gap (38) along said border (31) of said connection portion (10).

29. The connection (1) of claim 28 wherein:
a. said connection portion (10) has a top point (46) on said border (31) that is farthest away from said attachment portion (9); and
b. said connection portion (10) is substantially teardrop-shaped, the narrowest part being where said attachment portion (9) joins said connection portion (10), curving outward to widen on either side of said attachment portion (9) and then curving together to narrow again, coming to a point at said top point (46).

30. The connection (1) of claim 27 wherein:
a. said first pin connection (11) further comprises a first pin opening (12) in one of said cap (5) and said first side attachment member (8), and a first pin (13) that passes through said first pin opening (12);
b. said first pin (13) comprises a body (14) having a circumference (15), a first end (16), and a second end (17) with a first restraint extension (18) that extends beyond said circumference (15) of said body (14);
c. said first pin opening (12) has a circumference (19); and
d. said first restraint extension (18) extends beyond said circumference of said first pin opening (12), preventing said first pin (13) from withdrawing from said first pin opening (12).

31. The connection (1) of claim 30 wherein:
a. said first pin opening (12) is in said cap (5);
b. said first attachment member (8) additionally comprises a second pin opening (12) and said first pin (13) passes through said second pin opening (12);
c. said first pin (13) additionally comprises a second restraint extension (18) that extends beyond said circumference (15) of said body (14);
d. said second pin opening (12) has a circumference (19);
e. said second restraint extension (18) extends beyond said circumference (19) of said second pin opening (12), preventing said first pin (13) from withdrawing from said second pin opening (12).

32. The connection (1) of claim 31 wherein:
a. said first restraint extension (18) is a circumferential flange (18) that extends beyond said circumference (15) of said body (14) and said circumference (19) of said first pin opening (12);
b. said second restraint extension (18) is a circumferential flange (18) that extends beyond said circumference (15) of said body (14) and said circumference (19) of said second pin opening (12).

33. The connection (1) of claim 32 wherein:
a. said cap (5) additionally comprises a substantially planar top attachment portion (21) that interfaces with said supported structural member (3).

34. The connection (1) of claim 33 wherein:
a. said cap (5) additionally comprises a second substantially planar side attachment portion (22) that interfaces with said supported structural member (3).

35. The connection (1) of claim 34 wherein:
a. said connection portion (10) of said first side attachment member (8) additionally comprises a reinforcing embossment (25) around said first pin opening (12) in said first side attachment member (8).

36. The connection (1) of claim 35 wherein:
a. said first substantially planar side attachment portion (6) of said cap (5) additionally comprises a reinforcing embossment (25) around said second pin opening (12) that matches said reinforcing embossment (25) around said first pin opening (12) in said first side attachment member (8) so that said reinforcing embossment (25) and said reinforcing embossment (25) fit together and transmit bearing forces between said cap (5) and said first side attachment member (8).

37. The connection (1) of claim 36 wherein:
a. said substantially planar attachment portion (9) of said first side attachment member (8) additionally comprises a reinforcing flange (23).

38. The connection (1) of claim 37 wherein:
a. said first pin (13) is a rivet.

39. The connection (1) of claim 38 wherein:
a. said substantially planar side attachment portion (9) of said first side attachment member (8) additionally comprises fastener openings (55); and
b. said connection (1) additionally comprises fasteners (57) that pass through said fastener openings (55) in said first substantially planar side attachment portion (9) of said first side attachment member (8) and into said supporting structural member (2).

40. The connection (1) of claim 39 wherein:
a. said first and second substantially planar side attachment portions (6) and (22) of said cap (5) additionally comprise fastener openings (56); and
b. said connection (1) additionally comprises fasteners (58) that pass through said fastener openings (56) in said first and second substantially planar side attachment portions (6) and (22) of said cap (5) and into said supported structural member (3).

41. The connection (1) of claim 40 wherein:
a. said fasteners (57) that that pass through said fastener openings (55) in said first substantially planar side attachment portion (9) of said first side attachment member (8) are masonry screw anchors (57); and
b. said fasteners (58) that pass through said fastener openings (56) in said first and second substantially planar side attachment portions (6) and (22) of said cap (5) are self-drilling wood screws (58).

42. The connection (1) of claim 27 wherein:
a. said fastening portion (47) and said attachment portion ((9)) generally occupy substantially perpendicular planes.

43. The connection (1) of claim 27 wherein:
a. the greater part of said first and second straps (28) overlap.

44. The connection (1) of claim 27 wherein:
a. said first and second straps (28) have open ends (50) opposite said connection portion (10) and said open ends (50) are equidistant from said connection portion.

45. The connection (1) of claim 44 wherein:
a. a. the greater part of said first and second straps (28) overlap and said open ends (50) contact each other.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,716,877 B2
APPLICATION NO. : 11/217572
DATED : May 18, 2010
INVENTOR(S) : Jeremy Gilstrap

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

Column 31, line 57, claim 21, referencing "to an acute and toward said attachment portion (9);" should read "to an acute angle toward said attachment portion (9);".

Signed and Sealed this
Tenth Day of September, 2013

Teresa Stanek Rea
Acting Director of the United States Patent and Trademark Office